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NASA SP-7011 (167)

# AEROSPACE MEDICINE AND BIOLOGY

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## A CONTINUING BIBLIOGRAPHY

### WITH INDEXES

(Supplement 167)

MAY 1977

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

## ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges:

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| STAR (N-10000 Series) | N77-15974—N77-17994 |
| IAA (A-10000 Series) | A77-19299—A77-22950 |

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NASA SP-7011 (167)

# AEROSPACE MEDICINE AND BIOLOGY

## A CONTINUING BIBLIOGRAPHY WITH INDEXES

## (Supplement 167)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in April 1977 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 235 reports, articles and other documents announced during April 1977 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1977 Supplements.

# AVAILABILITY OF CITED PUBLICATIONS

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All publications abstracted in this Section are available from the Technical Information Service, American Institute of Aeronautics and Astronautics, Inc. (AIAA), as follows: Paper copies are available at $5.00 per document up to a maximum of 20 pages. The charge for each additional page is 25 cents. Microfiche[1] are available at the rate of $1.50 per microfiche for documents identified by the # symbol following the accession number. A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library. Minimum airmail postage to foreign countries is $1.00. Please refer to the accession number, e.g., (A77-10052), when requesting publications.

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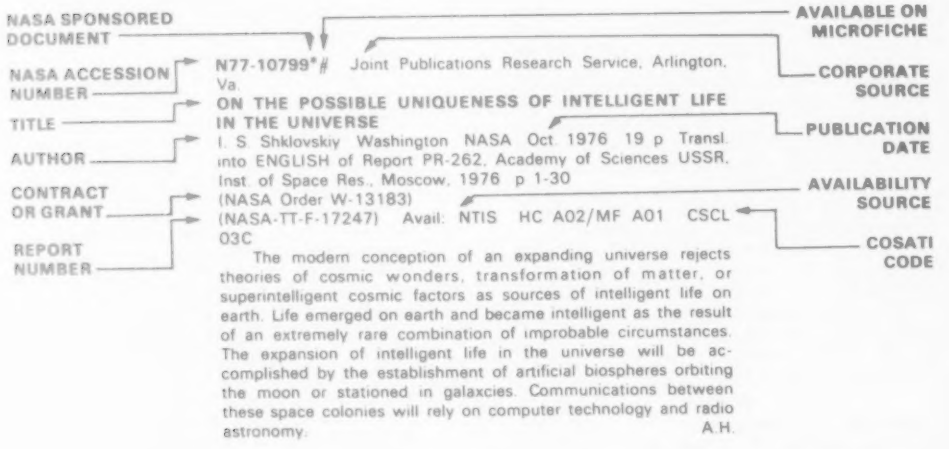
## TYPICAL CITATION AND ABSTRACT FROM *STAR*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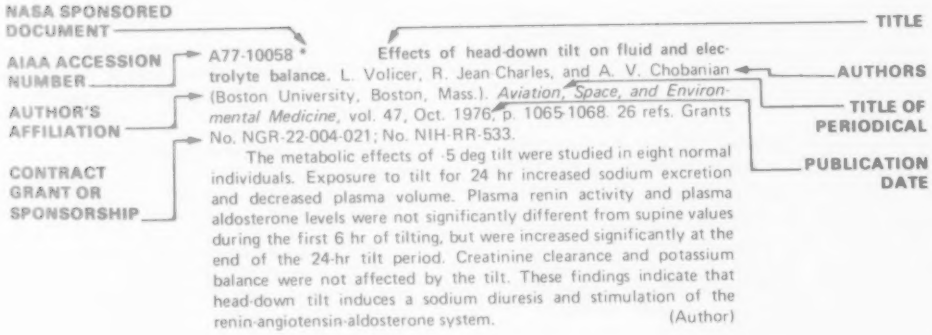
N77-10799*# Joint Publications Research Service, Arlington, Va.
ON THE POSSIBLE UNIQUENESS OF INTELLIGENT LIFE IN THE UNIVERSE
I. S. Shklovskiy Washington NASA Oct. 1976 19 p Transl. into ENGLISH of Report PR-262, Academy of Sciences USSR, Inst. of Space Res., Moscow, 1976 p 1-30
(NASA Order W-13183)
(NASA-TT-F-17247) Avail: NTIS HC A02/MF A01 CSCL 03C
The modern conception of an expanding universe rejects theories of cosmic wonders, transformation of matter, or superintelligent cosmic factors as sources of intelligent life on earth. Life emerged on earth and became intelligent as the result of an extremely rare combination of improbable circumstances. The expansion of intelligent life in the universe will be accomplished by the establishment of artificial biospheres orbiting the moon or stationed in galaxies. Communications between these space colonies will rely on computer technology and radio astronomy. A.H.

## TYPICAL CITATION AND ABSTRACT FROM *IAA*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A77-10058 * Effects of head-down tilt on fluid and electrolyte balance. L. Volicer, R. Jean Charles, and A. V. Chobanian (Boston University, Boston, Mass.). Aviation, Space, and Environmental Medicine, vol. 47, Oct. 1976, p. 1065-1068. 26 refs. Grants No. NGR-22-004-021; No. NIH-RR-533.
The metabolic effects of -5 deg tilt were studied in eight normal individuals. Exposure to tilt for 24 hr increased sodium excretion and decreased plasma volume. Plasma renin activity and plasma aldosterone levels were not significantly different from supine values during the first 6 hr of tilting, but were increased significantly at the end of the 24-hr tilt period. Creatinine clearance and potassium balance were not affected by the tilt. These findings indicate that head-down tilt induces a sodium diuresis and stimulation of the renin-angiotensin-aldosterone system. (Author)

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# AEROSPACE MEDICINE AND BIOLOGY

*A Continuing Bibliography (Suppl. 167)*

MAY 1977


## IAA ENTRIES

A77-19303 # **Locomotion system with elements of artificial intelligence (Lokomotsionnaia sistema s elementami iskusstvennogo intellekta).** D. E. Okhotsimskii, A. K. Platonov, G. K. Borovin, I. I. Karpov, E. I. Kugushev, Iu. M. Lazutin, V. E. Pavlovskii, and V. S. Iaroshevskii. In: Problems of analytical mechanics and stability and control theories. Moscow, Izdatel'stvo Nauka, 1975, p. 19-33. 6 refs. In Russian.

Multilevel algorithms for synthesis of the kinematics of a six-legged walking machine are examined. Motion of the machine over an uneven surface and in obstacle-overcoming mode is considered. The algorithms were developed on a computer with schematic display of the moving image of the walking machine.

P.T.H.

A77-19365 **Angiographic findings in asymptomatic aircrewmen with electrocardiographic abnormalities.** V. F. Froelicher, Jr., A. J. Thompson, R. Wolthuis, R. Fuchs, R. Balusek, M. R. Longo, Jr., J. H. Triebwasser, and M. C. Lancaster (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *American Journal of Cardiology*, vol. 39, Jan. 1977, p. 32-38. 32 refs.

Cardiac catheterization was used to evaluate 298 asymptomatic, apparently healthy aircrewmen with electrocardiographic abnormalities. Data from 27 additional symptomatic aircrewmen who underwent cardiac catheterization because of mild probable angina pectoris are also included. The men were grouped according to major reason for cardiac catheterization. The order of groups by increasing prevalence of coronary artery disease was as follows: abnormal treadmill test (labile lead only), supraventricular tachycardia, right bundle branch block, left bundle branch block, abnormal treadmill test, ventricular irritability, probable infarct and angina. Approximately 60 per cent of the men were completely free of angiographic coronary artery disease. Risk factors and other possible causes for the electrocardiographic abnormalities are discussed. The electrocardiographic abnormalities studied have a poorer predictive value for coronary artery disease in asymptomatic apparently healthy men than in a hospital or clinic population. (Author)

A77-19371 * **A technique for extracting blood samples from mice in fire toxicity tests.** T. J. Bucci, C. J. Hilado, and M. T. Lopez (San Francisco, University, San Francisco, Calif.). *Journal of Combustion Toxicology*, vol. 3, Nov. 1976, p. 465-470. 12 refs. Grant No. NsG-2039.

The extraction of adequate blood samples from moribund and dead mice has been a problem because of the small quantity of blood in each animal and the short time available between the animals' death and coagulation of the blood. These difficulties are particularly critical in fire toxicity tests because removal of the test animals while observing proper safety precautions for personnel is time-consuming. Techniques for extracting blood samples from mice were evaluated, and a technique was developed to obtain up to 0.8 ml of blood from a single mouse after death. The technique involves rapid exposure and cutting of the posterior vena cava and accumulation of blood in the peritoneal space. Blood samples of 0.5 ml or more from individual mice have been consistently obtained as much as 16 minutes after apparent death. Results of carboxyhemoglobin analyses of blood appeared reproducible and consistent with carbon monoxide concentrations in the exposure chamber. (Author)

A77-19375 **Reduction of flight fatigue by a pulsating seat cushion.** T. R. Morgan and J. P. Cooke (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *SAFE Journal*, vol. 6, Winter 1976, p. 18-22. 6 refs.

A pulsating-type seat cushion may reduce fatigue during 3-hour periods of physical inactivity for suited subjects seated in an ejection-type seat at a pressure equivalent to a cabin altitude of 25,000 ft (7,620 m). The feet were not moved during the test, simulating confinement in a small cockpit. Ultrasonic measurement of blood flow velocity showed a large reduction in flow velocity without the cushion. This finding agrees with subjective evaluation that the cushion reduced fatigue. (Author)

A77-19381 * # **The human operator in manual preview tracking /an experiment and its modeling via optimal control/.** M. Tomizuka (California, University, Berkeley, Calif.) and D. E. Whitney (Charles Stark Draper Laboratory, Inc., Cambridge, Mass.). *ASME, Transactions, Series G - Journal of Dynamic Systems, Measurement, and Control*, vol. 98, Dec. 1976, p. 407-413. 14 refs. Grant No. NGL-22-009-002.

A manual preview tracking experiment and its results are presented. The preview drastically improves the tracking performance compared to zero-preview tracking. Optimal discrete finite preview control is applied to determine the structure of a mathematical model of the manual preview tracking experiment. Variable parameters in the model are adjusted to values which are consistent to the published data in manual control. The model with the adjusted parameters is found to be well correlated to the experimental results. (Author)

A77-19451 **Prophylaxis for disturbances of external breathing in immersion.** Iu. N. Kamenskii and E. B. Shul'zhenko. *(Kosmicheskie Issledovaniia*, vol. 14, May-June 1976, p. 474-476.) *Cosmic Research*, vol. 14, no. 3, Nov. 1976, p. 427-429. 9 refs. Translation.

Two groups of young men were subjected to immersion for 6 days, followed by 'head-pelvis' overload to three units for 300 seconds. In the course of immersion, one group of subjects underwent 1.5 hours of head-pelvis overload daily. Respiratory parameters of both groups were monitored. It was found that the group subjected to 'training periods' of overload during immersion suffered less disruption of external respiration when exposed to postimmersion overload. C.K.D.

A77-19453 * # **The preparation of calcium superoxide for air breathing and scrubbing applications.** E. V. Ballou, P. C. Wood, L. A. Spitze (San Jose State University, San Jose, Calif.), and T. Wydeven (NASA, Ames Research Center, Moffett Field, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-1*. 10 p. 17 refs. Members, $1.50; nonmembers, $3.00. Research supported by the U.S. Bureau of Mines.

There is interest in the preparation of high-purity calcium superoxide as an oxygen source for breathing apparatus because both the available oxygen and the capacity for carbon dioxide removal, per unit weight of superoxide, are higher than that of a number of other chemical oxygen sources. A review of earlier findings shows that the general method used by Vol'nov and coworkers for the decomposition of calcium peroxide diperoxyhydrate can yield preparations containing more than 58.4% calcium superoxide maxi-

mum predicted for an equimolar disproportionation reaction. The decomposition of solid calcium peroxide diperoxyhydrate is studied using an apparatus that allows good control of the critical reaction parameters. The removal of water from decomposing calcium peroxide diperoxyhydrate, before the same water has an opportunity to back react with the calcium superoxide formed in the reaction, constitutes the rationale of the experiments. Even with allowance for the anomalies observed in the analytical results, the yields appear to be in the 65+ percent range, and optimization of the experimental variables is still being pursued. S.D.

A77-19454 # **Decomposition of some halogenated hydrocarbons over a fixed bed of platinum-alumina, alumina or molecular sieves.** D. Fevrier, G. Fevrier, J. L. Vernet (Toulon et Var, Centre Universitaire, La Garde, France), and P. Mignon (Direction des Constructions et Armes Navales, Toulon, France). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-2.* 7 p. Members, $1.50; nonmembers, $3.00.

An investigation is conducted concerning problems related to a possible contamination of the atmosphere by halogenated hydrocarbons in the case of the atmosphere regeneration system aboard French nuclear submarines. In such a system, an active charcoal filter removes a certain amount of the halogenated hydrocarbons. However, a part of these compounds may pass through the filter unchanged. This part can either be adsorbed on the molecular sieves used for removing the carbon dioxide or it may reach a catalytic burner employed to eliminate hydrogen and carbon monoxide from the decarbonated air. The behavior of halogenated hydrocarbons during the molecular sieve regeneration cycle is studied and their effect with respect to the catalyst in the burner is investigated. Two solutions to the considered problems are discussed. G.R.

A77-19456 # **CO2 removal from submarines atmosphere by IR-45 - Feasibility study.** P. Mignon (Direction des Constructions et Armes Navales, Toulon, France). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-4.* 7 p. Members, $1.50; nonmembers, $3.00.

Aminated resin Amberlite IR-45 has been investigated for CO2 removal from submarines atmosphere. A laboratory study has determined the optimum conditions for CO2 absorption: temperature, airflow rate, resin water loading, CO2 partial pressure and bed length. The sorbent is regenerated by steam at ambient pressure, dried by air with internal heating and cooled to 10 C for CO2 absorption. A large-scale testing has been performed on a 13-man size plant with two alternatively absorbing-desorbing beds. Results have proved the feasibility of the IR-45 system for submarine air decarbonation and have shown this sorbent to be competitive with molecular sieves currently used onboard French submarines. (Author)

A77-19458 # **The effect of H2O/H2 and CO2/CO ratios on the reduction of carbon dioxide in the Bosch process.** A. Sacco, Jr., M. P. Manning, and R. C. Reid (MIT, Cambridge, Mass.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-7.* 8 p. 7 refs. Members, $1.50; nonmembers, $3.00.

A combination of the Bosch process with water electrolysis provides an approach to eliminate the carbon dioxide excreted by the members of a spacecraft crew and to obtain the oxygen contained in the carbon dioxide again in elemental form. In the Bosch process the carbon dioxide reacts with hydrogen in a recycle reactor, which contains iron as a catalyst, to form elemental carbon and water. An experimental investigation of the Bosch process shows that the actual reaction processes involved are more complex than indicated by the assumed summary reaction and yield also methane and CO. The equilibria for the investigated system are discussed and attention is given to several alternate Bosch processing schemes that may reduce recycle penalties. S.D.

A77-19459 * # **Monitoring complex trace-gas mixtures by long-path laser absorption spectrometry.** B. D. Green and J. I. Steinfeld (MIT, Cambridge, Mass.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-8.* 8 p. 20 refs. Members, $1.50; nonmembers, $3.00. Grant No. NGR-22-009-766.

Laser-based spectrophotometric methods, which have been proposed for the detection of trace concentrations of gaseous contaminants, include Raman and passive radiometry. The paper discusses a simple long-path laser absorption method which is capable of resolving complex mixtures of closely related trace contaminants likely to accumulate in closed environments, such as submarines or long-duration manned space flights. Absorption coefficients at CO2 laser wavelengths were measured, accurate to + 3 per cent or better, for each of these species. This data base was then used to determine the presence and concentration of the contaminants in prepared mixtures of 12 to 15 gases. Computer programs have been developed which will permit a real-time analysis of the monitored atmosphere. Minimum detectable concentrations for individual species are generally in the ppm range, and are not seriously degraded by interferences even in complex mixtures. Estimates of the dynamic range of this monitoring technique for various system configurations and comparison with other methods of analysis are discussed. (Author)

A77-19461 # **Development of a water quality monitor for spacecraft application.** S. J. West, M. S. Frant, and J. W. Ross, Jr. (Orion Research, Inc., Cambridge, Mass.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-10.* 9 p. 10 refs. Members, $1.50; nonmembers, $3.00.

A Breadboard Water Quality Monitoring System has been developed for the NASA Johnson Space Center. Upon continued development, the system will find eventual use in spacecraft water reclamation systems to monitor the potability of reclaimed water. The system has been developed to measure conductivity, pH, and total organic carbon (TOC) content, and is capable of operation under zero gravity conditions. Conductivity is measured by an ac bridge method; pH by an all solid-state pH capillary; and TOC by photochemical oxidation of organic material to CO2, and measurement of the resulting CO2 with a capillary CO2 electrode. Inorganic CO2 is removed via a semi-permeable membrane prior to the oxidation step. Test results indicate good reproducibility for the three measurements in a wide range of test solutions. (Author)

A77-19462 * # **Experimental study of the constituents of space wash water.** G. V. Colombo and D. F. Putnam (Umpqua Research Co., Myrtle Creek, Ore.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-11.* 9 p. Members, $1.50; nonmembers, $3.00. Contract No. NAS2-8239.

Data are presented that quantify some of the various constituents of human origin that may be expected in space wash water. The experiments were conducted under controlled conditions with a simulated crew of two male and two female subjects. The data show that the expected wash water constituents originating from human secretions are substantially lower than theoretical projections have indicated. Average daily quantities as well as individual extremes are given for both shower and laundry water. In addition, concentrations are presented for a projected model of wash water usage in a space station. (Author)

A77-19463 * # **The development of a positive isolation disconnect.** A. A. Rosener (Martin Marietta Aerospace, Denver, Colo.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-12.* 13 p. Members, $1.50; nonmembers, $3.00. Contract No. NAS9-14376.

Conceptual design and developmental testing were conducted to determine the feasibility of a highly reliable, positive isolation disconnect (PID) for potential inflight maintenance of Shuttle environmental control/life support system subsystems. The PID design consists of two coupled valves, each capable of fluid isolation through the use of individually operated opposing poppets. An integral level clamping mechanism couples the two valves and locks the bodies together. The coupling lever is locked in position by

turning the valve stems that have foolproof caps. The stem shaft has an integral cam that turns inside a yoke to open the poppet to permit fluid flow. Results of 5000 life cycle tests, hydraulic lock test, leakage tests, and pressure drop tests are included. (Author)

A77-19465 * # **A mature Bosch CO2 reduction technology.** C. D. King and R. F. Holmes (General Dynamics Corp., Convair Div., San Diego, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-14.* 9 p. 11 refs. Members, $1.50; nonmembers, $3.00. Contract No. NAS8-27276.

The reduction of CO2 is one of the steps in closing the oxygen loop for long-duration manned space missions. Several units utilizing the Bosch process, which catalytically reduces CO2 with hydrogen, have been built and operated during the past decade. Each contributed substantial information affecting subsequent designs. Early challenges were primarily concerned with carbon control, materials durability, and reliability of reaction initiation. These were followed by concern about power consumption, expendable weight, volume, and process rate control. Suitable materials and techniques for carbon containment and process reliability have been demonstrated. Power requirements have been reduced by almost an order of magnitude. Methods for significant reductions in expendable weight and volume have been developed. The technology is at a state of maturity directly applicable to designs for space missions. (Author)

A77-19466 # **Design, fabrication and testing of a spacecraft wet oxidation system including trash pulverization studies.** R. B. Jagow (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-15.* 8 p. Members, $1.50; nonmembers, $3.00.

A waste processing system is currently under development for spacecraft application that utilizes the wet oxidation principle to process human feces and urine in order to recover oxygen and water for reuse in the spacecraft. The paper presents the results of a program to design, fabricate, and test a demonstration system incorporating the previously developed component designs and process conditions. The system design is described. Test objectives, operations, and results from a 737-hr evaluation test are summarized. Post-test redesign and retest efforts are discussed. In addition to the system development work, the results of a trash pulverizing and processing investigation are also presented. The development of a spacecraft waste model and the general approach taken in the waste pulverization investigation are described. The problem of producing a pumpable slurry from a variety of plastic, paper, cloth and semi-solid materials capable of being introduced into the reactor for reasonable weight, volume, and power penalties is examined. Several pulverizer designs are discussed and the results of pulverizer and solids transport tests are presented. (Author)

A77-19467 # **The development of a biological specimen holding facility for spaceflight.** R. B. Maine, L. L. Reed, and M. Ballestrasse (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, ASME, Transactions, Series G - Journal of Dynamic Systems, Measurement, and Control*, vol. 98, Dec. 1976, p. 407-413. 14 refs. Grant No. NGL-22-009-002.

A manual preview tracking experiment and its results are presented. The preview drastically improves the tracking performance compared to zero-preview tracking. Optimal discrete finite preview control is applied to determine the structure of a mathematical model of the manual preview tracking experiment. Variable parameters in the model are adjusted to values which are consistent to the published data in manual control. The model with the adjusted parameters is found to be well correlated to the experimental results. (Author)

A77-19468 * # **Organism support for life sciences spacelab experiments.** G. L. Drake and D. B. Heppner (General Dynamics Life Sciences Laboratories for Shuttle Spacelab, San Diego, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-17.* 9 p. 8 refs. Members, $1.50; nonmembers, $3.00. Research supported by the General Dynamics Corp.; Contracts No. NAS8-26468; No. NAS8-29150; No. NAS8-30288; No. NAS8-31368.

This paper presents an overview of the U.S. life sciences laboratory concepts envisioned for the Shuttle/Spacelab era. The basic development approach is to provide a general laboratory facility supplemented by specific experiment hardware as required. The laboratory concepts range from small carry-on laboratories to fully dedicated laboratories in the Spacelab pressurized module. The laboratories will encompass a broad spectrum of research in biology and biomedicine requiring a variety of research organisms. The environmental control and life support of these organisms is a very important aspect of the success of the space research missions. Engineering prototype organism habitats have been designed and fabricated to be compatible with the Spacelab environment and the experiment requirements. These first-generation habitat designs and their subsystems have supported plants, cells/tissues, invertebrates, and small vertebrates in limited evaluation tests. Special handling and transport equipment required for the ground movement of the experiment organisms at the launch/landing site have been built and tested using these initial habitat prototypes. (Author)

A77-19470 # **Electrolytic urine pretreatment.** B. M. Greenough (Lockheed Missiles and Space Co., Inc., Sunnyvale, Calif.) and N. T. Thomas (Lockheed Aircraft Service Co., Ontario, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-19.* 9 p. Members, $1.50; nonmembers, $3.00.

Electrolysis is a candidate step in the processing of human urine to recover potable water in a spacecraft environment. A laboratory study was conducted to elucidate the reaction mechanisms in the electrolysis of urine, to explore the effects of selected process parameters, and to evaluate electrode materials for corrosion-resistance in this application. Parametric test results obtained from a full-scale, one-man breadboard electrolytic urine treatment system are described. A detailed chemical analysis of the residual constituents in the electrolyzed urine is presented along with recommended post-treatment process candidates based on the nature of these constituents. (Author)

A77-19473 * # **Microbiology studies in the Space Shuttle.** G. R. Taylor (NASA, Johnson Space Center, Houston, Tex.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-23.* 11 p. 55 refs. Members, $1.50; nonmembers, $3.00.

Past space microbiology studies have evaluated three general areas: microbe detection in extraterrestrial materials; monitoring of autoflora and medically important species on crewmembers, equipment, and cabin air; and in vitro evaluations of isolated terrestrial species carried on manned and unmanned spaceflights. These areas are briefly reviewed to establish a basis for presenting probable experiment subjects applicable to the Space Shuttle era. Most

extraterrestrial life detection studies involve visitations to other heavenly bodies. Although this is not applicable to the first series of Shuttle flights, attempts to capture meteors and spores in space could be important. Human pathogen and autoflora monitoring will become more important with increased variety among crewmembers. Inclusion of contaminated animal and plant specimens in the space lab will necessitate inflight evaluation of cross-contamination and infection potentials. The majority of Shuttle microbiology studies will doubtless fall into the third study area. Presence of a space lab will permit a whole range of experimentation under conditions similar to these experienced in earth-based laboratories. The recommendations of various study groups are analyzed, and probable inflight microbiological experiment areas are identified for the Life Sciences Shuttle Laboratory. (Author)

A77-19474 * # **Environmental parameters of shuttle support for life sciences experiments.** J. M. Waligora (NASA, Johnson Space Center, Houston, Tex.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-24.* 6 p. 8 refs. Members, $1.50; nonmembers, $3.00.

The environments provided by the Orbiter vehicle and by the Spacelab will differ substantially from the environment provided by prior spacecraft. The specific design limits for each environmental parameter and expected operating characteristics are presented for distributed control and bounded measurable or piecewise continuous control functions. No assumption is needed concerning the existence and uniqueness of the solution to the corresponding nonlinear initial-boundary-value problem for every admissible control. G.R.

A77-19477 * # **Life Sciences Laboratories for the Shuttle/Spacelab.** L. O. Schulte, H. B. Kelly, and T. C. Secord (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-28.* 12 p. Members, $1.50; nonmembers, $3.00. Contract No. NAS8-31367.

Space Shuttle and Spacelab missions will provide scientists with their first opportunity to participate directly in research in space for all scientific disciplines, particularly the Life Sciences. Preparations are already underway to ensure the success of these missions. The paper summarizes the results of the 1975 NASA-funded Life Sciences Laboratories definition study which defined several long-range life sciences research options and the laboratory designs necessary to accomplish high-priority life sciences research. The implications and impacts of Spacelab design and development on the life sciences missions are discussed. An approach is presented based upon the development of a general-purpose laboratory capability and an inventory of common operational research equipment for conducting life sciences research. Several life sciences laboratories and their capabilities are described to demonstrate the systems potentially available to the experimenter for conducting biological and medical research. (Author)

A77-19478 # **The role of Shuttle in Health Care Systems development for space stations.** W. B. Lewis and E. W. Cravens (Boeing Co., Houston, Tex.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-29.* 9 p. 9 refs. Members, $1.50; nonmembers, $3.00.

The NASA Space Shuttle program of the 1980's will be an economical and technological breakthrough in low cost space travel. It will provide the vital tool for the industrialization of space including the construction of solar power satellites (POWERSAT) planned for 1990's and early 21st century, which will send the solar energy to earth in the form of microwave beams. The problem of developing efficient Health Care System for these complexes will be solved by structured Shuttle experimental payloads/missions. The future space systems will have space base dispensaries. Shuttle ambulances will carry the patients either to the space dispensaries or to Site-based Medical Units on Earth. Different space complexes will be medically directed and supported by a Ground-based System Elements. The ultimate success of this space utilization and exploration program will depend upon careful structuring of the Shuttle experimental payloads/missions, to support the overall research and development effort. A.Y.

A77-19479 * # **Conceptual design of a biological specimen holding facility.** J. K. Jackson and M. M. Yakut (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-30.* 11 p. Members, $1.50; nonmembers, $3.00. Contract No. NAS8-31490.

An all-important first step in the development of the Spacelab Life Science Laboratory is the design of the Biological Specimen Holding Facility (BSHF) which will provide accommodation for living specimens for life science research in orbit. As a useful tool in the understanding of physiological and biomedical changes produced in the weightless environment, the BSHF will enable biomedical researchers to conduct in-orbit investigations utilizing techniques that may be impossible to perform on human subjects. The results of a comprehensive study for defining the BSHF, description of its experiment support capabilities, and the planning required for its development are presented. Conceptual designs of the facility, its subsystems and interfaces with the Orbiter and Spacelab are included. Environmental control, life support and data management systems are provided. Interface and support equipment required for specimen transfer, surgical research, and food, water and waste storage is defined. New and optimized concepts are presented for waste collection, feces and urine separation and sampling, environmental control, feeding and watering, lighting, data management and other support subsystems. (Author)

A77-19480 * # **Development of a preliminary design of a method to measure the effectiveness of virus exclusion during water process reclamation at zero-G.** A. S. Fraser, A. F. Wells, H. J. Tenoso, and C. B. Linnecke (Organon Diagnostics, El Monte, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-32.* 10 p. Members, $1.50; nonmembers, $3.00. NASA-sponsored research.

Organon Diagnostics has developed, under NASA sponsorship, a monitoring system to test the capability of a water recovery system to reject the passage of viruses into the recovered water. In this system, a non-pathogenic marker virus, bacteriophage F2, is fed into the process stream before the recovery unit and the reclaimed water is assayed for its presence. An engineering preliminary design has been performed as a parallel effort to the laboratory development of the marker virus test system. Engineering schematics and drawings present a preliminary instrument design of a fully functional laboratory prototype capable of zero-G operation. (Author)

A77-19483 * # **Integrated testing of an electrochemical depolarized CO2 concentrator /EDC/ and a Bosch CO2 reduction subsystem /BRS/.** F. H. Schubert (Life Systems, Inc., Cleveland, Ohio), D. C. Clark (NASA, Marshall Space Flight Center, Huntsville, Ala.), and P. D. Quattrone (NASA, Ames Research Center, Moffett Field, Calif.). *American Society of Mechanical Engineers, Inter-*

*society Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-35.* 13 p. 20 refs. Members, $1.50; nonmembers, $3.00.

An oxygen reclamation system (ORS) in a spacecraft has the task to revitalize the spacecraft atmosphere by recovering the elementary oxygen from metabolically produced carbon dioxide and water vapor. Life support subsystems which can form such an ORS are an electrochemical depolarized carbon dioxide concentrator (EDC), a Bosch carbon dioxide reduction subsystem (BRS), and an oxygen generation subsystem (OGS). A total recovery of the oxygen from metabolically generated carbon dioxide can be obtained with the aid of system composed of the considered three subsystems. Attention is given to the control concept which assures an integrated operation of the EDC, BRS, and OGS. A description is presented of the test results obtained during 86 days of testing. G.R.

A77-19485 * # **Oxygen electrocatalysts for life support systems.** W. E. O'Grady, C. Iwakura, and E. Yeager (Case-Western-Reserve University, Cleveland, Ohio). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-37.* 11 p. 14 refs. Members, $1.50; nonmembers, $3.00. NASA-Navy-supported research.

The irreversibility of the oxygen electrode increases by 30 to 60 percent the energy required for water electrolysis over the thermodynamic value in life support systems involving conventional water electrolysis cells. To minimize this voltage loss, high area electrocatalysts, such as platinum metal, are often used for the O2 anode, but even so, the losses are still very substantial. In an attempt to find more effective electrocatalysts for this application, a number of defect metal oxides have been examined. (Author)

A77-19493 * # **Planning for life sciences research in space.** K. M. Mallory, Jr. (Kenneth Mallory and Associates, Inc., Alexandria, Va.) and S. Deutsch (NASA, Washington, D.C.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-52.* 8 p. Members, $1.50; nonmembers, $3.00.

Invitations to participate in planning the NASA Life Sciences Program in Space were mailed to members of the Life Sciences community at large during April 1975. The invitation is related to current planning for Life Sciences research in space during the 1980's, taking into account a use of the Space Shuttle, Spacelab, and the unmanned Biological Experiments Scientific Satellite (BESS). A response form to be completed and returned to NASA by the scientists included questions requesting suggestions on topics-for-research, laboratory equipment, and test specimens. A description of the invitation results is presented, taking into account general response, respondent specialties, laboratory equipment, test specimens, and research objectives. Attention is also given to an Announcement of Opportunities (AO) for the Space Transportation System. The AO was issued by the Office of Space Science in March 1976. G.R.

A77-19495 * # **Technology transfer from space to earth - The NASA Firefighter's Breathing System.** P. B. McLaughlan (NASA, Johnson Space Center, Houston, Tex.), T. Anuskiewicz (Informatics Information Systems Co., Baltimore, Md.), and F. A. Keune (United Technologies Corp., Hamilton Standard Div., Windsor Locks, Conn.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-54.* 11 p. 8 refs. Members, $1.50; nonmembers, $3.00.

Responding to the recent demand of fire services for a better equipment, NASA has prepared two improved versions of Firefighter's Breathing System (FBS) by taking advantage of the spacesuit design. In the new FBS, the conventional oxygen tube is replaced by a 40% lighter air tube with twice as much pressure. The load is attached to a wide waist belt and distributed on the hips instead of the shoulder, thus making it easier to carry. The two versions of the FBS are essentially the same, the only difference being the capacities of the air tubes. Also the face mask used is smaller, lighter and provides better vision and mobility. The FBS had a notable impact, with the fire departments reporting improved efficiency. Unlike other technology transfer cases, the FBS concept is commercially successful in finding diverse fields of application. A.Y.

A77-19503 * # **Payload influences on technology development and utilization of the Space Shuttle extravehicular mobility unit.** J. W. Patrick and E. F. Kraly (Rockwell International Corp., Space Div., Downey, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-62.* 7 p. Members, $1.50; nonmembers, $3.00. NASA-supported research.

Historical EVA approaches are examined. The considered data emphasize the overall importance of EVA for Shuttle payload operations. Twenty requirement categories related to crew protection, crew performance, and payload protection are listed in a table. Attention is given to a preliminary assessment of payload related requirements, an evaluation of the natural thermal environment in the case of the Shuttle orbiter bay, and the ability of the extravehicular mobility unit (EMU) to protect the crewman from induced or natural radiation as found in the Van Allen radiation belt South Atlantic anomaly. On the basis of the evaluation it appears very likely that design improvements alone can make the EMU meet payload requirements without requiring significant technology advances. G.R.

A77-19505 * # **A fusible heat sink concept for extravehicular activity /EVA/ thermal control.** G. J. Roebelen, Jr. (United Technologies Corp., Hamilton Standard Div., Windsor Locks, Conn.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-64.* 5 p. Members, $1.50; nonmembers, $3.00. Contract No. NAS2-8912.

This paper describes the preliminary design and analysis of a heat sink system, utilizing a phase change slurry material, to be used for astronaut and equipment cooling during manned space missions. During normal use, excess heat in the liquid cooling garment (LCG) coolant is transferred to a regenerable fusible heat sink. Recharge is accomplished by disconnecting the heat sink from the liquid cooling garment and placing it in an onboard freezer for simultaneous slurry refreeze and power supply recharge. (Author)

A77-19508 # **Planning for biomedical research in space - The visiting research scientist.** A. A. Kelton (McDonnell Douglas Astronautics Co., Life Sciences Div., Huntington Beach, Calif.). *American Society of Mechanical Engineers, Intersociety Conference on Environmental Systems, San Diego, Calif., July 12-15, 1976, Paper 76-ENAs-67.* 14 p. 21 refs. Members, $1.50; nonmembers, $3.00.

Recurrent difficulties in interfacing between spacecraft experimental accommodations and constraints and organizers of research experiments (specifically biomedical) with varying levels of familiarity with spacecraft constraints are outlined and recommendations are presented. Conduct of a mail questionnaire and a list of institutions visited are discussed, along with other problems common to participating institutions (including: funding, publications and

patents, unique facilities or location). Recommendations deal with interchanges of information, proprietary rights to data, organizational structure of the visiting scientist program, development of interfacing experiment engineers, experiment simulation, and the common operational research equipment (CORE) concept, among others. R.D.V.

A77-19549 **Experimental study of myocardial infarction through the use of body surface isopotential maps - Ligation of the anterior descending branch of the left coronary artery.** S. Sugiyama, M. Wada, J. Sugenoya, H. Toyoshima, J. Toyama, and K. Yamada (Nagoya University, Nagoya, Japan). *American Heart Journal*, vol. 93, Jan. 1977, p. 51-59. 20 refs. Research supported by the Japan Heart Foundation and Mitsui Life Social Welfare Foundation.

Experiments were conducted on 11 mongrel dogs weighing 8-12 kg to determine whether diagnostic accuracy can be achieved from body surface isopotential maps in differentiating the location and extent of myocardial infarction caused experimentally by ligation of the orifice or branch of the left anterior descending coronary artery. Eighty five unipolar lead ECGs recorded onto the magnetic tape were reproduced, transmitted to an A/D converter, and treated by the mapping system with a minicomputer. The dogs with experimental myocardial infarction were classified into three groups according to the location and extent of the infarction. The results indicate that sequential maps are suitable for diagnosing the location and extent of myocardial infarction. S.D.

A77-19673 **An indirect method of measuring perceived distance from familiar size.** W. C. Gogel (California, University, Santa Barbara, Calif.). *Perception and Psychophysics*, vol. 20, no. 6, Dec. 1976, p. 419-429. 14 refs. Grant No. PHS-MH-15651.

Two methods of measuring perceived distance as a function of familiar size were compared in five experiments. The method which uses the perception of motion concomitant with a motion of the head, unlike the method of verbal report, is considered to provide a measure of perceived distance that is unaffected by factors of cognitive distance. The results of the experiments indicate that although the perceived egocentric distance of an object can vary somewhat as a function of the cue of familiar size, the larger variation often found with verbal reports of distance is based upon cognitive, not perceptual, information. The cognitive information is interpreted as resulting from the perception of the object as off-sized and the observer's assumption that the perceived size of an object will vary inversely with its physical distance. (Author)

A77-19674 **Model for a three-dimensional optical illusion.** M. E. Jernigan and M. Eden (MIT, Cambridge, Mass.). *Perception and Psychophysics*, vol. 20, no. 6, Dec. 1976, p. 438-444.

A homogeneous coordinate system is used to describe the transformation from a real three-dimensional stimulus to an illusory three-dimensional perceptual object. The model comprises a series of transformations of which one acts as an illusion operator. The illusion operator is specified by a single parameter whose value determines whether the real or the illusory object is perceived. An experiment to test one prediction derived from the model was performed. The results confirm the prediction. (Author)

A77-19675 **Peripheral visual acuity and refractive error - Evidence for 'two visual systems'.** C. A. Johnson, H. W. Leibowitz (Pennsylvania State University, University Park, Pa.), M. Millodot (University of Wales Institute of Science and Technology, Cardiff, Wales), and A. Lamont (Montreal, University, Montreal, Canada). *Perception and Psychophysics*, vol. 20, no. 6, Dec. 1976, p. 460-462. 21 refs. Research supported by the University of Montreal; Grant No. NIH-MH-08061.

Experiments conducted in two independent laboratories indicate that the correction of refractive errors does not improve peripheral visual acuity. This finding contrasts with previous results for motion detection and other visual functions in the periphery. The 'two visual systems' hypothesis provides a heuristic means of interpreting this apparent discrepancy. (Author)

A77-19749 * **Solution to a gene divergence problem under arbitrary stable nucleotide transition probabilities.** R. Holmquist (California, University, Berkeley, Calif.). *Journal of Molecular Evolution*, vol. 8, no. 4, 1976, p. 337-349. 10 refs. Grant No. NGR-05-003-460.

A nucleic acid chain, L nucleotides in length, with the specific base sequence B(1)B(2) ... B(L) is defined by the L-dimensional vector B = (B(1), B(2), ..., B(L)). For twelve given constant non-negative transition probabilities that, in a specified position, the base B is replaced by the base B' in a single step, an exact analytical expression is derived for the probability that the position goes from base B to B' in X steps. Assuming that each base mutates independently of the others, an exact expression is derived for the probability that the initial gene sequence B goes to a sequence B' = (B'(1), B'(2), ..., B'(L)) after X = (X(1), X(2), ..., X(L)) base replacements. The resulting equations allow a more precise accounting for the effects of Darwinian natural selection in molecular evolution than does the idealized (biologically less accurate) assumption that each of the four nucleotides is equally likely to mutate to and be fixed as one of the other three. Illustrative applications of the theory to some problems of biological evolution are given. V.P.

A77-19750 * **The possible role of solid surface area in condensation reactions during chemical evolution - Reevaluation.** N. Lahav and S. Chang (NASA, Ames Research Center, Chemical Evolution Branch, Moffett Field, Calif.). *Journal of Molecular Evolution*, vol. 8, no. 4, 1976, p. 357-380. 66 refs.

Using surface concentration and reaction rate as the main criteria for the feasibility of condensation reactions, four types of prebiotic environments were analyzed: (1) an ocean-sediment system, (2) a dehydrated lagoon bed produced by evaporation, (3) the surface of a frozen sediment, and (4) a fluctuating system where hydration (rainstorms, tidal variations, flooding) and dehydration (evaporation) take place in a cyclic manner. With the possible exception of nucleotides, low adsorption of organomonomers on sediment surfaces of a prebiotic ocean (pH 8) is expected, and significant condensation is considered unlikely. In dehydrated and frozen systems, high surface concentrations are probable and condensation is more likely. In fluctuating environments, condensation rates will be enhanced and the size distribution of the oligomers formed during dehydration may be influenced by a 'redistribution mechanism' in which adsorbed oligomers and monomers are desorbed and redistributed on the solid surface during the next hydration-dehydration cycle. (Author)

A77-19943 # **Foundations of aviation and space medicine (Osnovy aviatsionnoi i kosmicheskoi meditsiny).** A. A. Lavnikov. Moscow, Voenizdat, 1975. 360 p. In Russian.

The present work outlines the influence of various flight factors on the human body, with particular reference to the characteristics of space flights. Physiologic-hygienic features of flight vehicle cabins and oxygen respiratory devices are discussed. Featured topics include accelerations during flight and their effect on the human organism, influence of different types of flight on the pilot's body, nutrition of flying personnel, and basic hygiene and prevention related to maintenance of aircraft and spacecraft equipment and materials. S.D.

A77-19944 **Amine repletion in the reserpinized cat - Effect upon PGO waves and REM sleep.** D. C. Brooks and M. D. Gershon (Cornell University, New York, N.Y.). *Electroencephalography and Clinical Neurophysiology*, vol. 42, Jan. 1977, p. 35-47. 34 refs.

Selective repletion of 5-hydroxytryptamine (5-HT) and catecholamines in the reserpinized implanted cat was used to study the role of these biogenic amines in the regulation of the ponto-geniculo-occipital (PGO) wave and sleep. The discussion covers the effect of 5-hydroxytryptophan (5-HTP) administration on PGO-RES (present in reserpinized animals), the effect of dihydroxyphenylalanine (DOPA) administration on PGO-RES, the effect of 5-HTP and DOPA on evoked PGO waves, and the effect of amine repletion on sleep. Results suggest that two neuronal systems - one employing 5-HT and the other catecholamines - play a part in the regulation of PGO-RES, and presumably, PGO-REM (normally present during REM sleep). The 5-HT system may be primarily responsible for suppressing PGO-REM during slow wave sleep, with the catecholamine system playing a comparable part during wakefulness. Earlier reports that DOPA induces REM sleep in the reserpinized animal were not confirmed. S.D.

A77-19945 **The scalp topography of human somatosensory and auditory evoked potentials.** G. D. Goff, Y. Matsumiya, T. Allison, and W. R. Goff (U.S. Veterans Administration Hospital, West Haven; Yale University, New Haven, Conn.). *Electroencephalography and Clinical Neurophysiology*, vol. 42, Jan. 1977, p. 57-76. 39 refs. Research supported by the U.S. Veterans Administration Hospital of West Haven; NSF Grants No. GB-3919; No. GB-5782; Grant No. NIH-MH-05286.

A77-19946 **Latency of the steady state visual evoked potential.** A. L. Diamond (Simon Fraser University, Burnaby, British Columbia, Canada). *Electroencephalography and Clinical Neurophysiology*, vol. 42, Jan. 1977, p. 125-127. National Research Council Grant No. A-9940.

The steady-state evoked potential (EP) involves the averaging of the cerebral potentials that result from the successive pulses of a stimulus repeating at frequencies usually faster than 1/sec. A technique is proposed for measuring the latency of the steady-state EP to the separate flashes of a flickering light. The technique makes it possible to measure the EPs to a train of brief square-wave light pulses and to calculate from the recorded potentials the latency of the EP to any one of the light pulses. This latency is found to be shorter for short interflash intervals than for long interflash intervals. The average short latency for three subjects was 61 msec and the average long latency 119 msec. The results obtained are in good agreement with other previous estimates of latency. S.D.

A77-20126 # **Circadian rhythms of the activity of the sympatho-adrenal system in the healthy man (O sutochnykh ritmakh aktivnosti simpato-adrenalovoi sistemy u zdorovogo cheloveka).** E. A. Matlina, V. N. Vasil'ev, and S. D. Galimov (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Fizkul'tury, Moscow, USSR). *Fiziologiia Cheloveka*, vol. 2, Nov.-Dec. 1976, p. 970-985. 86 refs. In Russian.

Available published materials are reviewed concerning the circadian rhythms for the release of catecholamines, their precursors, and metabolites in the healthy man in the resting state, under neuro-emotional stress, during exercise, and during change of time zones. It is shown that release of the cited substances in healthy young individuals varies in a definite circadian rhythm, and that the resulting changes are due to the diurnal dynamics of the activity of the sympatho-adrenal system. Elderly persons are found to exhibit rhythm disturbance consisting of the absence of nighttime reduction in the release of catecholamines. The changes are more pronounced when working at night than working in the daytime. The higher amplitude of epinephrine release fluctuation in athletes as compared to untrained persons points to permanent stress on the adrenal medulla in modern high-level sports activities. Change of time zones during long-distance flights results in disordered circadian rhythm for release of catecholamines. S.D.

A77-20127 # **Changes in the protein fractions of human skeletal /soleus/ muscle subjected to hypokinesia and possibility of preventing these changes by means of a special set of exercises (Izmenenie belkovykh fraktsii skeletnoi /kambalovidnoi/ myshtsy cheloveka pod vliianiem gipokinezii i vozmozhnost' profilaktiki etikh izmenenii s pomoshch'iu spetsial'nogo kompleksa uprazhnenii).** M. S. Gaevskaia, L. M. Kurbina, E. V. Kolchina, N. S. Kolganova, and N. A. Veresotskaia. *Fiziologiia Cheloveka*, vol. 2, Nov.-Dec. 1976, p. 997-1001. 16 refs. In Russian.

A77-20128 # **A moisture-sensitive transducer for measuring respiration rate during muscular activity (Vlagochuvstvitel'nyi datchik dlia izmereniia chastoty dykhaniia v usloviiakh dvigatel'noi aktivnosti).** V. A. Kozlovskii and Iu. G. Solonin (Nauchno-Issledovatel'skii Institut Gigieny Truda i Profzabolevanii, Sverdlovsk, USSR). *Fiziologiia Cheloveka*, vol. 2, Nov.-Dec. 1976, p. 1049-1051. 5 refs. In Russian.

A77-20161 # **Learning algorithm using an adaptive net for control of an unknown object (Algorytm uczenia sie z zastosowaniem sieci adaptacyjnej do sterowania nieznanym obiektem).** B. Macukow (Warszawa, Politechnika, Warsaw, Poland) and R. Gawronski (Politechnika Swietokrzyska, Kielce, Poland). *Archiwum Automatyki i Telemechaniki*, vol. 21, no. 4, 1976, p. 503-526. 12 refs. In Polish.

The paper considers certain principles of operation of a specialized stratified net constructed from neuron-like elements with controlled parameters, used for optimal control of a complex object described by a system of equations satisfying certain general conditions of single-valuedness and stability. Various structural properties of the object are used to select the structure of the control net. P.T.H.

A77-20222 # **Medical support during the period of retraining for a new aviation technique (Meditsinskoe obespechenie poletov v period pereuchivaniia na novuiu aviatsionnuiu tekhniku).** S. A. Gozulov and N. I. Frolov. *Voenno-Meditsinskii Zhurnal*, Nov. 1976, p. 55-58. In Russian.

The paper discusses the fundamental aspects of medical support in the course of retraining for a new aviation technique pertaining to third-generation aircraft involving a large number of control and navigational equipment, high control-system automation, and increasing dependence of the pilot on ground-based control systems. The three aspects are defined as medical, psychophysiological, and physiological-hygienic. The medical aspect includes measures to preserve the health and working capacity of flying, technical, and flight control personnel. The psychophysiological aspect incorporates studies of the activity of the flying personnel during mastering of a retraining program, along with the development of medical recommendations directed to upgrade flight safety. The physiological-hygienic aspect comprises measures resulting from the habitation conditions in the cockpit of a new aircraft and the specificity of the cockpit's technical maintenance. S.D.

A77-20223 # **Vestibular stability of flying personnel afflicted with diseases of the gastrointestinal tract (Vestibuliarnaia ustoichivost' letnogo sostava s zabolevaniiami zheludochno-kishechnogo trakta).** S. R. Raskatova. *Voenno-Meditsinskii Zhurnal*, Nov. 1976, p. 59-61. In Russian.

Vestibulometric tests involving Coriolis acceleration were conducted on 50 flying personnel subjects afflicted with duodenal ulcer (30 persons) and lambliasis invasion (20 persons). The control group consisted of 170 healthy subjects. The results confirm a well-defined relationship between vestibular stability and condition of the gastrointestinal tract. Vestibulometric tests are shown to be suitable for evaluating both the vestibular stability and the intensity of the underlying disease. Estimation of vestibular stability in persons with diseases of the gastrointestinal tract should rely upon cumulative tests involving Coriolis and rectilinear accelerations. S.D.

A77-20327 # **Changes of the parameters of human attention under the influence of a decrease in motor activity /hypokinesia/ (Ob izmerenii parametrov vnimaniia cheloveka pod vliianiem snizheniia dvigatel'noi aktivnosti /gipokinezii/).** O. G. Gazenko, B. M. Fedorov, V. G. Pikus, V. A. Tarannikova, and T. M. Sinitsina. *Akademiia Nauk SSSR, Doklady*, vol. 230, Oct. 11, 1976, p. 1240, 1241. 5 refs. In Russian.

Sixteen subjects were subjected to active attention tests consisting of the sequential touching of 24 red and 25 black numerals on a display, with the red touched in ascending, the black in descending order. Ten of the subjects were a control group with normal motor responses; the remaining six had just undergone a 30-day period of forced hypokinesia involving bed rest on a bed tilted 4 degrees down from the horizontal at the head. The sequential touching was accompanied by auditory interference and electric shocks in the case of mistakes. It was found that the attention responses of all the subjects who had undergone hypokinesia were sharply worsened, but that they were almost wholly restored 10-12 days after bed rest ended. B.J.

A77-20368 **Changes in transthoracic electrical impedance at high altitude.** R. S. Hoon, V. Balasubramanian, S. C. Tiwari, O. P. Mathew, A. Behl, S. C. Sharma, and K. S. Chadha (Ministry of Defence, Armed Forces Medical Services, New Delhi, India). *British Heart Journal*, vol. 39, Jan. 1977, p. 61-66. 20 refs. Research supported by the Armed Forces Medical Research Committee.

An automatic balancing digital impedance plethysmograph was used to estimate serial changes in the mean transthoracic electrical impedance in 121 healthy volunteers aged 21-35 yrs at sea level and at an altitude of 3658 m. The subjects were divided into four groups: (1) group A comprised 50 lowlanders normally resident at altitudes below 1000 m; (2) group B consisted of 30 permanent highlanders born and raised at altitudes above 3000 m; (3) group C included 16 lowlanders having spent 120-180 days at 3658 m just before the study; and (4) group D encompassed 25 lowlanders exposed to 3658 m after slow ascent by road and enroute acclimatization. Symptoms of high-altitude sickness are discussed in terms of decreased impedance. The results indicate that transthoracic electrical impedance measurement is suitable for detecting incipient high-altitude edema. S.D.

A77-20401 # **Stabilization of a biped walking machine (Stabilizatsiia dvunogogo shagaiushchego apparata).** V. B. Larin. *Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela*, Sept.-Oct. 1976, p. 4-13. 7 refs. In Russian.

The problem of vertical, longitudinal, and lateral stabilization of a simple version of a biped walking machine is discussed. It is shown that vertical stabilization can be achieved by varying the forces in the legs; while the longitudinal and lateral stabilization problems can be solved by proper selection of the point of support of the legs at each step. It is noted that the coordinates of the point of support can be determined with the aid of linear regulators. In this case, it should be possible to use the effective synthesis methods available for optimal linear systems to solve the control problem for a walking machine. Some aspects of optimizing the parameters of the synthesized regulators are examined, along with the results of a computer simulation of the motion of a biped machine along a rough surface. V.P.

A77-20425 # **Experimental investigation of the psychic related and the light-reflective additive properties of the pupillary regulation system without feedback (Experimentelle Untersuchung der psychisch bedingten und der lichtreflektorisch additiven Eigenschaften des nicht rückgekoppelten Pupillenregelkreises).** A. Fazel-Madjlessi. München, Technische Universität, Fachbereich Elektrotechnik, Dr.-Ing. Dissertation, 1976. 213 p. 162 refs. In German.

An investigation is conducted of the additive properties of the open pupillary regulation system in the case of psychic and light-reflective reactions, taking into account the existing anatomical structures. The method of pupillometrics developed by Müller-Limmroth (1962, 1964) is employed to measure the psychic reaction of the pupil. A description is given of an experimental device which was developed for providing the optic stimuli in the investigation. The functional anatomy and physiology of the pupillary regulation system are considered and the conduction of the experiments is discussed. Attention is given to reaction-time measurements, local additive properties, and temporal additive properties in the case of the pupillary regulation system. G.R.

A77-20442 * # **Failure detection by pilots during automatic landing - Models and experiments.** E. G. Gai (Charles Stark Draper Laboratory, Inc., Cambridge, Mass.) and R. E. Curry (MIT, Cambridge, Mass.). *Journal of Aircraft*, vol. 14, Feb. 1977, p. 135-141. 16 refs. Grant No. NGR-22-009-733.

A model is proposed to describe the pilot as a monitor of automatic landing systems. The failures treated are equivalent to the addition of a dynamic change in the mean of the observation process. The failure detection model of the pilot consists of two stages: a linear estimator (Kalman filter) and a decision mechanism based on sequential analysis. The filter equations are derived from a simplified version of the linearized dynamics of the airplane and the control loop. The perceptual observation noise is modified to include the effects of allocation of attention among the several instruments. The final result is a simple model consisting of a high-pass filter to produce the observation residuals and a decision function which is a pure integration of the residuals minus a bias term. The dynamics of a Boeing 707 were used to simulate the fully coupled final approach in a fixed-base simulator. Observers monitored the approaches and detected the failures; their performance was compared with the predictions of the model. (Author)

A77-20604 # **Presentation of information to pilots.** R. L. Gregory (Bristol, University, Bristol, England). In: Symposium on the Presentation of Information to Pilots, London, England, March 18, 1976, Proceedings. London, Royal Aeronautical Society, 1976. 12 p.

The paper shows that perception in pilots depends on deploying stored knowledge rather than on responding directly to stimuli. In spite of present research in artificial intelligence, man remains far superior to machines at using limited information for recognizing patterns and objects. Ways of increasing the effective use of limited information are examined. Perceptions are suggested to be equivalent to hypotheses in science, since both of them are of predictive nature, are based on limited information, and are subject to the same kind of limits and errors. Perceptual limitations and illusions are discussed, showing how far perception can be relied upon in the presence of restricted information. The use of instruments is appropriate when purely visual scaling information is not adequate or is systematically misleading. S.D.

A77-20722 **Theory and practice in flight simulation; Proceedings of the Third Symposium, London, England, April 8, 1976.** Symposium sponsored by the Royal Aeronautical Society. London, Royal Aeronautical Society, 1976. 121 p. $7.80.

The present collection of papers examines current theory and practice in flight simulation, with particular reference to visual and

motion cues and the transfer of training. Attention is directed to ways in which the manufacturing industry is attempting to make training through simulation more cost-effective and to make the simulator a more fitting tool for use by instructors. The specification of requirements for flight simulation and simulators are fairly straightforward except for the visual and motion system. Experiences from research and development simulation could be used to a greater extent for the benefit of training simulation. S.D.

A77-20741 # **Stabilization of coacervate systems of products of abiogenic oxidation of low-molecular compounds using gamma-radiation energy (Stabilizatsiia koatservatnykh sistem produktami abiogennogo okisleniia nizkomolekuliarnykh soedinenii s ispol'zovaniem energii gamma-izlucheniia).** T. N. Evreinova, A. M. Kuzin, L. M. Kriukova, T. G. Kameneva, and Iu. R. Khrust (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 231, Nov. 11, 1976, p. 489-491. 12 refs. In Russian.

A77-20864 # **Consideration of certain ergonomic factors during the simulation of pilot behavior (Prise en compte de certains facteurs ergonomiques lors de la modélisation du comportement du pilote).** D. Soulatges (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France). *(Colloque sur la Biomécanique du Pilotage, 2nd, Toulouse, France, Nov. 24-26, 1976.) ONERA, TP* no. 1976-83, 1976. 9 p. 13 refs. In French.

Some theoretical considerations are presented concerning the development of a computer simulation program for the behavior of a pilot in the context of a pilot-aircraft system where emphasis is on pilotability. Pilotability is determined as a function of pilot performance and the work load of the pilot. Certain ergonomic factors are taken into account including definition of the task, the operative image of the pilot, his strategy, his degree of training, and his level of alertness. Experience in developing a simulation program of this type associated with electrooculographic investigation of the pilot is discussed. B.J.

A77-20875 * **Effect of ambient temperature on the thermal profile of the human forearm, hand, and fingers.** L. D. Montgomery and B. A. Williams (NASA, Ames Research Center, Environmental Control Research Branch, Moffett Field, Calif.). *Annals of Biomedical Engineering*, vol. 4, 1976, p. 209-219. 20 refs.

Forearm, hand, and finger skin temperatures were measured on the right and left sides of seven resting men. The purpose was to determine the bilateral symmetry of these segmental temperature profiles at ambient temperatures from 10 to 45 C. Thermistors placed on the right and left forearms, hands, and index fingers were used to monitor the subjects until equilibration was reached at each ambient temperature. Additionally, thermal profiles of both hands were measured with copper-constantan thermocouples. During one experimental condition (23 C ambient), rectal, ear canal, and 24 skin temperatures were measured on each subject. Average body and average skin temperatures are given for each subject at the 23 C ambient condition. Detailed thermal profiles are also presented for the dorsal, ventral, and circumferential left forearm, hand, and finger skin temperatures at 23 C ambient. No significant differences were found between the mean skin temperatures of the right and left contralateral segments at any of the selected ambient temperatures. (Author)

A77-20977 **Biological and medical applications of the Spacelab.** H. B. Kelly and K. H. Houghton (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). *British Interplanetary Society, Journal*, vol. 30, Feb. 1977, p. 47-53. 8 refs.

The paper shows that The Life Sciences Laboratory aboard the Spacelab for space research in the 1980s will afford the investigator the opportunity to manipulate experimental material directly and the flexibility to alter experimental procedures in response to unforeseen results. Particular attention is directed to pertinent research programs, experiment accommodation and laboratory configuration, and accommodation of biological specimens. Active consideration is being given to a biological research centrifuge whose primary function would be to provide a one-g control for specimens aboard the Spacelab in order to better isolate gravity as the only independent variable in the biological experiments. Planning for medical and biological research on the Spacelab is discussed in terms of experiment selection and development, hardware development, and mission planning and support. Constructive cooperation is required for the program to realize its enormous potential. S.D.

A77-20978 **Brief human vacuum exposure in relation to space rescue operations.** M. A. Bodin. *British Interplanetary Society, Journal*, vol. 30, Feb. 1977, p. 55-62. 40 refs.

The paper presents a reappraisal of short-term human vacuum exposure in space rescue operations, based on extrapolation from animal studies, speculation, and some provisional practical proposals. It is shown that average tolerance to near vacuum exposure is much higher than would be expected from previous decompression or theoretical studies, although wide individual variations occur. Under favorable circumstances, most animals are found to survive exposures up to 90-120 sec. Cerebral anoxia is apparently refuted as the cause of death. CO2 depletion and reversal of physiological lactacidosis are suggested to be more important than anoxia in the cause of death. The role of supplementary CO2 and correction of secondary alkalosis in resuscitation is discussed. Brief vacuum exposure in emergency space rescue is examined relative to procedure for vacuum exposure and transfer, recompression and resuscitation, and special requirements for rescue vehicle facilities. S.D.

A77-21136 **Recent advances on biometeorology and practical applications of natural and simulated altitude climate; International Congress, Ancona, Italy, September 5-9, 1976, Preprints.** Parts 1 & 2. Congress sponsored by the Istituto Nazionale di Riposo e Cura per Anziani. Ancona, Italy, Istituto Nazionale di Riposo e Cura per Anziani, 1976. Pt. 1, 147 p.; pt. 2, 26 p. In English, Italian, and German.

Physiological and clinical effects at different natural altitudes are considered taking into accout changes of physico-chemical properties of human and animal blood under long-term action of hypoxia, clinical and experimental studies with diabetic patients in adult age in high mountain climate, practical applications of natural and simulated altitude adaptation, mountain climate and cardiovascular pathology, and immune responses at high altitude. Attention is also given to clinical and experimental studies with neurotic patients in high mountain climate, metabolic aspects in acclimatization, climatophysiological investigations carried out in natural and simulated altitude climate, and the correspondence of air pollution and asthmatic attack in urban areas. G.R.

A77-21164 **Serum myocardial enzymes after +Gz acceleration.** D. R. Sellers, J. S. Kirkland, J. A. Kennealy, C. M. Oloff, and N. Vittorio (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 1-4. 16 refs. USAF-sponsored research.

Circulating levels of lactate dehydrogenase, glutamate-oxaloacetate, glutamate-pyruvate transaminase, and creatine phosphokinase, as well as its isoenzymes, were measured to investigate the possibility of myocardial damage during acceleration to high +Gz. Serum samples were analyzed in 12 human volunteers before, 6 hr after, and 24 hr after several bouts of acceleration to 6, 8, 9, and 10

G. No substantial elevations of enzyme activities were observed. However, multivariate analysis of variance and multiple comparisons of the data indicated a small but statistically significant (p less than 0.01) increase in creatine phosphokinase. The results were consistent with enhanced skeletal muscle cell permeability consequent to muscular exercise. (Author)

A77-21165 **Hearing under stress. II - Effect of hyperventilation and hypercapnia on speech discrimination.** G. L. Whitehead, R. C. Goode, A. M. Rubin, W. H. Johnson, and D. P. Bryce (Toronto, University, Toronto, Canada). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 5, 6. 8 refs. Defence Research Board of Canada Grant No. 931-126.

A77-21166 * **Comparison of susceptibility to motion sickness during rotation at 30 rpm in the earth-horizontal, 10 deg head-up, and 10 deg head-down positions.** A. Graybiel (U.S. Naval Aerospace Medical Center, Aerospace Medical Research Laboratory, Pensacola, Fla.) and J. R. Lackner (Brandeis University, Waltham; MIT, Cambridge, Mass.). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 7-11. 10 refs. NASA Order T-5904-B.

Normal persons rotated about an earth-horizontal axis vary in their susceptibility to motion sickness. An experimental study was conducted to measure intraindividual differences in susceptibility in 12 subjects when rotated 10 deg head up and 10 deg head down as well as in the horizontal position. Subjects assumed the test-position 60 min prior to rotation, thus providing an opportunity for translocation of body fluids. Physiological and psychological measurements were conducted throughout the experiment. There were no intraindividual differences in susceptibility to motion sickness in the three positions tested, although there were significant differences in vital capacity, demonstrating the expected fluid shifts. It was concluded that, in the sample of subjects tested, short-term effects of fluid shifts greater than those that would be manifested in zero gravity had no definite effect on motion sickness susceptibility. (Author)

A77-21167 **State of spermatogenesis in rats flown aboard the biosatellite Cosmos-690.** G. I. Plakhuta-Plakutina (Ministry of Health of USSR, Institute of Biomedical Problems, Moscow, USSR). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 12-15. 18 refs.

Testes of 30 rats flown aboard the biosatellite Cosmos 690 for 20.5 days and 30 rats kept in a ground-based experiment simulation flight conditions except weightlessness and acceleration, were examined morphologically. On the 10th experimental day the rats were exposed for 24 hr to gamma irradiation from a Cs-137 source at doses of 220, 800, and 955 rad. Testes from 60 nonirradiated rats that remained in the vivarium were used as controls. On the 1st-2nd and 26-27th post-experimental days the animals showed a significant decrease in the weight of testes, post-radiation death of spermatogonia, and important structural changes in the spermatogenic epithelium, whose level depended on the dose of irradiation and the time elapsed after the exposure. No significant differences were observed in the weight of testes, frequency of occurrence of individual components of the spermatogenic epithelium, and time of emergence of reparative processes. No modifying effect of space flight factors on the development of radiation-induced changes in the spermatogenic epithelium of rats was found. (Author)

A77-21168 **Self-rated moods of humans at 4300 m pretreated with placebo or acetazolamide plus staging.** L. E. Banderet (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 19-22. 29 refs.

Self-rated moods were determined twice daily with the Clyde Mood Scale on 35 human subjects at 200 m (baseline) during a study concerned with evaluating the efficacy of staging plus acetazolamide (treatment) for the prevention of acute mountain sickness (AMS). Mood states also were determined on all subjects at 4300 m (Pikes Peak, Colorado) and on 18 of these subjects at 1600 m (staging site). Mood state changes were not observed at 1600 m, but four of the six mood factors were sensitive to the 4300 m altitude. At 4300 m, all subjects, treatment and control, rated themselves as less friendly and clear thinking and more sleepy and dizzy. At 4300 m, the treatment strategy resulted in an improved mood on the friendly, sleepy, and dizzy factors. Altitude-induced changes in clear thinking were not altered by the treatment strategy. (Author)

A77-21169 **Analysis of the human voice as a method of controlling emotional state - Achievements and goals.** P. V. Simonov and M. V. Frolov (Akademiia Nauk SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 23-25. 13 refs.

Background factors and those of formant structure, spectral and spectro-temporal characteristics of rapid and slow speech components, temporal peculiarities, and intensity of speech turned out to be informative indices of the human emotional state. Application of mathematical methods, in particular methods of recognition theory, to these factors helped to assess the degree and the psychological sign of emotion, to diagnose the status of attention and fatigue, and to differentiate emotional and physical stress. The paper outlines the results obtained in model experiments on cosmonaut A. Leonov at different flight stages, including EVA, on Voskhod 2. (Author)

A77-21170 **Interdependence of decompression sickness and plasma enzymes on dive profile and vitamin B-6 status.** V. Frattali, M. Quesada, and R. Robertson (National Naval Medical Center, Naval Medical Research Institute, Bethesda, Md.). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 29-32. 15 refs. Navy Task MPN10,02,408-0BDK9.

The mortality rate due to decompression injury was found to be significantly greater in a rat population with a mild vitamin B-6 deficiency, compared to an adequately fed control group, when subjected to a bends-producing N2-O2 dive. Relative post-dive changes in lactate dehydrogenase, creatine phosphokinase, and transaminase levels in plasma do not appear to be sufficiently different to allow a ready distinction in the degree of susceptibility of one nutritionally defined population from the other. (Author)

A77-21171 **Discussion of the combined effect of weightlessness and ionizing radiation on the mammalian body - Morphological data.** V. V. Portugalov, E. A. Savina, A. S. Kaplanskii, V. I. Iakovleva, G. N. Durnova, A. S. Pankova, V. N. Shvets, E. I. Alekseev, and P. I. Katunian (Ministry of Health of USSR, Institute of Biomedical Problems, Moscow, USSR). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 33-36. 6 refs.

The combined effect of weightlessness and ionizing radiation from the Cs-137 source at 800 rad for 24 hr, on the animal body was studied. The morphological examination of organs and tissues of rats flown aboard the biosatellite Cosmos 690, kept in the ground-based simulation experiment, and kept in the vivarium, indicated prevalence of radiation-induced changes in both experimental groups of rats. An exposure of animals to space flight factors did not produce a substantial aggravation of radiation-induced effects. This is indicated by the lack of significant differences in the weight of testes, thymus

and spleen of flight and simulation rats. However, this exposure affected adversely the development of reparative processes in the hemopoietic tissue of the bone marrow. Inflight irradiation aggravated weightlessness-induced changes. A combined effect of weightlessness and irradiation did not result in the summation of the effects exerted on skeletal muscles by either factor alone. (Author)

A77-21172 **Influence of sex and age on the susceptibility of mice to oxygen poisoning.** S. Berry, J. W. Fitch, and C. L. Schatte (Colorado State University, Fort Collins, Colo.). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 37-39. 6 refs.

A77-21173 **Effect of increased pressures of oxygen, nitrogen, and helium on activity of a Na-K-Mg ATPase of beef brain.** S. K. Hemrick and S. F. Gottlieb (Purdue University, Fort Wayne, Ind.). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 40-43. 11 refs. Research supported by the William Randolph Hearst Foundation.

A77-21174 **Cockpit thermal conditions and crew skin temperatures measured in flight.** S. A. Nunneley and G. R. James (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 44-47. 16 refs.

Thermal conditions in aircraft cockpits may affect crew performance, yet few inflight measurements are available. The Miniature Environmental Monitor records air temperature, dewpoint, black globe temperature, and air velocity for up to 4 hr, and was designed specifically for deployment in fighter cockpits. Environmental conditions were recorded during a series of desert flights aboard an F-111A; skin temperatures of a crewman were also monitored. Air temperatures approaching 60 C were recorded during taxi. Inflight steady-state cockpit temperature rose with each increase in speed or decrease in altitude. Mean skin temperatures ranged from 28.3 to 38.9 C, with head temperatures up to 43 C. Heat stress in the cockpit comes from high climatic temperature, radiant heating, and requirements that aircrew wear special protective clothing. The discussion includes problems in the design and evaluation of aircraft environmental control systems. (Author)

A77-21175 **Bubble formation within decompressed hen's eggs.** C. V. Paganelli, R. H. Strauss, and D. E. Yount (Hawaii, University, Honolulu, Hawaii). *Aviation, Space, and Environmental Medicine*, vol. 48, Jan. 1977, p. 48, 49. 12 refs. Grant No. NOAA-04-5-158-17.

Decompression sickness follows a reduction in ambient pressure and is a result of bubble formation in blood or tissues. The origin of such bubbles is the subject of considerable controversy, and a number of mechanisms have been proposed to account for them. In testing these mechanisms, freshly-laid hen's eggs provide a particularly intriguing model - namely, an intact biological system in which bubbles form readily and many of the proposed processes are excluded. (Author)

A77-21300 **Origin of body surface QRS and T wave potentials from epicardial potential distributions in the intact chimpanzee.** M. S. Spach, R. C. Barr, C. F. Lanning, and P. C. Tucek (Duke University, Medical Center, Durham, N.C.). *Circulation*, vol. 55, Feb. 1977, p. 268-278. 27 refs. Research supported by the National Foundation March of Dimes; Grants No. PHS-HL-11307; No. PHS-HL-05716; No. PHS-HL-07101.

A77-21576 * **Transient circadian internal desynchronization after light-dark phase shift in monkeys.** M. C. Moore-Ede, D. A. Kass, and J. A. Herd (Harvard University, Boston and Southboro, Mass.). *American Journal of Physiology*, vol. 232, Jan. 1977, p. R31-R37. 30 refs. Contract No. NAS9-14249; Grants No. NIH-GN-22085; No. NIH-HL-14150.

In four conscious chair-acclimatized squirrel monkeys (Saimiri sciureus) studied with lights on (600 lx) from 0800 to 2000 hr daily, prominent 24-hr rhythms in feeding, drinking, activity, body temperature, and urinary potassium, sodium, and water excretion were seen. When the monkeys were subjected to 36 hr of darkness followed by 36 hr of light, each variable demonstrated a circadian rhythm which was not passively dependent on the light-dark cycle. After the 24-hr light-dark cycle was abruptly phase-delayed by 8 hr, all the rhythms resynchronized with the new light-dark cycle phase, demonstrating that light-dark cycles are an effective zeitgeber. However, the resynchronization of the rhythms of feeding, drinking, activity, and body temperature was 90% complete within approximately 2 days while the 90% resynchronization of the urinary rhythms took approximately 5 days. These results suggest that the circadian timing system in S. sciureus may consist of several spontaneously oscillating units which can become transiently uncoupled during perturbations of environmental time cues. (Author)

A77-21577 * **Exercise, dietary obesity, and growth in the rat.** G. C. Pitts and L. S. Bull (Virginia, University, Charlottesville, Va.). *American Journal of Physiology*, vol. 232, Jan. 1977, p. R38-R44. 31 refs. Contract No. NAS2-1554.

A77-21581 **A dipole plus quadrupole lead system for human electrocardiography.** R. F. Trost (Baylor University, Houston, Tex.), R. M. Arthur (Washington University, St. Louis, Mo.), D. B. Geselowitz (Pennsylvania State University, University Park, Pa.), and S. A. Briller (Allegheny General Hospital, Pittsburgh, Pa.). *Journal of Electrocardiology*, vol. 10, Jan. 1977, p. 27-38. 17 refs. Research supported by the Ben Taub Laboratories for Cardiovascular Research Fund; Grants No. NIH-HL-17269; No. PHS-HE-08805; No. PHS-5-T01-GM-00606; No. PHS-FR-15.

A77-21582 **Interaction of oscillators - Effect of sinusoidal stretching of the sinoatrial node on nodal rhythm.** J. Ushiyama and C. M. Brooks (Downstate Medical Center, Brooklyn, N.Y.). *Journal of Electrocardiology*, vol. 10, Jan. 1977, p. 39-44. 23 refs. Research supported by the New York Heart Association.

Isolated strips of rabbit atria incorporating the sinoatrial node were subjected to sinusoidal stretch in order to determine the effects of sinusoidal stretch on the rates of firing and the regularity of rhythms of the sinoatrial node. The sinusoidal stretch was effected by means of an RC type oscillator feeding through a power amplifier to a galvanometer. A 20-40% increase in strip length above that assumed by the free floating tissue was attained. It is shown that slow rates of applied stretch induce a slow one-to-one oscillation in pacemaker rate. Faster rates of stretch induced other rhythms considerably slower than that of the stretch. When the rate of stretch approached that of the node's natural frequency, there was a 'lock-in' in the sense that sinus rate accelerated but oscillations disappeared. When rate of stretch became nearly twice that of the pacemaker there was again a lock-in. Application of sinusoidal stretch resulted in greater regularity on pacemaker action. It is concluded that oscillatory stretch can affect the intrinsic oscillatory processes of the cardiac pacemaker and an interaction of oscillators can conceivably occur in the heart. S.D.

A77-21583 **Mechanism of atrioventricular conduction - Study on an analogue.** D. A. Sideris and S. D. Moulopoulos (Athens,

National Capodistrian University, Athens, Greece). *Journal of Electrocardiology*, vol. 10, Jan. 1977, p. 51-58. 31 refs.

A simple analog of the heart, consisting of neon relaxation oscillators, is presented. The analog may display several disturbances of the A-V conduction, like normal atrioventricular (A-V) conduction, first-degree heart block, Wenckebach periods, Mobitz II type block, supernormal conduction, complete A-V block, the phenomenon of accrochage in complete A-V block and the absolutely arrhythmic response of the ventricles to a very high atrial rate. The analog was constructed in the simplest possible way, i.e., using the least possible number of variables. The striking similarities between the properties of relaxation oscillators and cardiac pacemakers on the one hand and between the behavior of the analog and manifestations of the A-V conduction abnormalities on the other might possibly permit a hypothesis about the mechanism of A-V conduction abnormalities based on the analog. This mechanism is discussed in detail. (Author)

A77-21584 **The electrocardiographic image surface, revisited.** D. A. Brody, D. M. Mirvis, F. W. Keller, J. W. Cox, and R. E. Ideker (Tennessee, University, Memphis, Tenn.). *Journal of Electrocardiology*, vol. 10, Jan. 1977, p. 79-85. 19 refs. Grants No. NIH-HL-14032; No. NIH-HL-01362; No. NIH-HL-09495.

An image torso may be viewed as a one-to-one transform of a physical volume conductor to a geometric form which defines both the axis and sensitivity of any electrocardiographic connection. In this report, the image surfaces of laminar, spherical, rectangular and humanoid physical torsos are explored theoretically and experimentally. All proved to be rounded or spherical in form despite the marked differences in the configuration of the physical conductor. Moderate degrees of dipole eccentricity induced only small departures from this basic circular pattern. Introduction of phase inhomogeneity, however, resulted in more striking deviations from roundness. (Author)

A77-21599 **How good are work noise standards.** A. Moller (Royal Caroline Institute, Stockholm, Sweden). *New Scientist*, vol. 73, Jan. 27, 1977, p. 192-194.

Short-term and long-term effects of high-level industrial noise on hearing and on general human health, physiological responses and pathological responses to industrial noise, and the state of (or lack of) knowledge on the subject are examined. The variable susceptibility of humans (from one subject to another, or even same subject at different ages) to noise-induced pathology rules out diagnosis and prediction except on a statistical basis at present. Temporary threshold shift, permanent threshold shift, effects of other factors, and other discernible effects of industrial noise (tinnitus, vertigo, headache, fatigue) are discussed. 'Acceptable' noise levels are assessed, possible noise effects on blood circulation, adrenalin and ACTH secretion, on hypothalamus function, and on liver function in detoxification of carcinogens are considered. R.D.V.

A77-21648 # **Arterial pressure 'tracking' in the circulatory system ('Slezhenie' za velichinoi arterial'nogo davleniia v sisteme krovoobrashcheniia).** N. M. Amosov, B. A. Beregovskii, O. I. Lissova, and B. L. Palets (Akademiia Nauk Ukrainskoi SSR, Institut Kibernetiki, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal SSSR*, vol. 62, Nov. 1976, p. 1628-1635. 24 refs. In Russian.

Steady-state characteristics of arterial and venous pressure, cardiac output, total peripheral resistance, heart rate, and pumping heart capacity depending on blood volume change were studied in dogs under conditions of rest, exercise, light, and deep narcosis. Tracking of mean arterial pressure was found to be the main principle of hemodynamic regulation. In unanesthetized animals the tracking is based on heart regulation component mainly, while under light narcosis it is the vascular component. In deep narcosis tracking principle is suppressed: arterial pressure change is proportional to blood volume changes. (Author)

A77-21649 # **Working capacity of skeletal muscles and energetics of muscular work (Rabotosposobnost' skeletnykh myshts i energetika myshechnoi raboty pri adaptatsii k kholodu).** E. la. Tkachenko, M. A. Iakimenko, and K. P. Ivanov (Akademiia Meditsinskikh Nauk SSSR, Novosibirsk; Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 62, Nov. 1976, p. 1698-1702. 16 refs. In Russian.

Experiments were conducted on mongrel male white rats weighing 250-350 g to assess the influence of long-term cold adaptation and norepinephrine on the following indicators of muscular working capacity and energetics of muscular work: force of muscular contraction, muscular work, muscular fatigue, electrical activity and temperature of muscles during contraction. Cold adaptation of the animals took place at a temperature in the range 2-4 C for 6-8 weeks in separate cages, while the control group was kept at 25 C. It is shown that cold adaptation reduces the force of muscular contraction as well as muscular working capacity. The cold-adapted animals were capable of maintaining the initial force of muscular contraction for a longer time than the controls, exhibiting higher level of energy expenditure than the controls. In the case of norepinephrine administration, changes in the working capacity of the skeletal muscles of the control animals were similar to those taking place in the cold-adapted animals. S.D.

A77-21709 # **Influence of heredity and environmental factors on the development of physical working capacity in man (Vpliv spadkovosti ta faktoriv seredovishcha na rozvitok fizichnoi pratsezdatnosti liudini).** L. P. Sergienko (Mikolaivs'kii Pedagogichnii Institut, Nikolaev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 22, Nov.-Dec. 1976, p. 755-759. 8 refs. In Ukrainian.

Experiments were conducted on identical and fraternal twins with the twins technique in combination with the PWC-170 test in order to study the effect of hereditary and environmental factors on the development of human physical working capacity. It is found that human physical working capacity during development as determined by PWC-170 indices depends to a larger extent on hereditary than environmental factors. The share of heredity is greater when determining the PWC-170 indices for kg of body weight. As a result of training, the growth rate of physical working capacity is essentially determined by environmental factors. S.D.

A77-21710 # **Resuscitation after asphyxia-induced prolonged clinical death by the artificial circulation technique of S. S. Briukhonenko (Ozhivlennia organizmu pislia trivaloi klinichnoi smerti vid asfiksii z dopomogoiu metodu shtuchnogo krovoobigu S. S. Briukhonenka).** I. I. Lanovenko, V. D. Inkovs'kii, and A. S. Liavinets' (Akademiia Nauk Ukrains'koi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 22, Nov.-Dec. 1976, p. 803-809. 18 refs. In Ukrainian.

Experiments were conducted on adult mongrel dogs of both sexes experiencing 13-15 min of clinical death due to mechanical asphyxia and resuscitated by the extracorporeal circulation technique of S. S. Briukhonenko (1964) in order to study the dynamics of extinction and recovery of key vital functions and unconditioned reflexes. It is shown that resuscitation after asphyxia-induced prolonged clinical death may be successful only by maintaining the bulk blood flow in the body 1.2 to 1.5 times as high as the level of normal cardiac output. S.D.

A77-21752 * **Perception of binary acoustic events associated with the first heart sound.** D. H. Spodick (St. Vincent Hospital; Massachusetts, University, Worcester, Mass.). *American Heart Journal*, vol. 93, Feb. 1977, p. 137-140. 21 refs. Grant No. NGR-22-012-026.

The resolving power of the auditory apparatus permits discrete vibrations associated with cardiac activity to be perceived as one or more events. Irrespective of the vibratory combinations recorded by conventional phonocardiography, in normal adults and in most adult patients auscultators tend to discriminate only two discrete events associated with the first heart sound S1. It is stressed that the heart sound S4 may be present when a binary acoustic event associated with S1 occurs in the sequence 'low pitched sound preceding high pitched sound', i.e., its components are perceived by auscultation as 'dull-sharp'. The question of S4 audibility arises in those individuals, normal and diseased, in whom the major components of S1 ought to be, at least clinically, at their customary high pitch and indeed on the PCG appear as high frequency oscillations. It is revealed that the apparent audibility of recorded S4 is not related to P-R interval, P-S4 interval, or relative amplitude of S4. The significant S4-LFC (low frequency component of S1) differences can be related to acoustic modification of the early component of S1. S.D.

A77-21900 **The scalp topography of human visual evoked potentials.** T. Allison, Y. Matsumiya, G. D. Goff, and W. R. Goff (U.S. Veterans Administration Hospital, West Haven; Yale University, New Haven, Conn.). *Electroencephalography and Clinical Neurophysiology*, vol. 42, Feb. 1977, p. 185-197. 28 refs. U.S. Veterans Administration Grant No. MRIS-3185-01; NSF Grants No. GB-3919; No. GB-5782; Grant No. NIH-MH-05286.

Results are presented for an experimental study designed to provide a description of the spatial and temporal properties of all detectable scalp-recorded visual evoked potential (VEP) components evoked by brief centrally-viewed unpatterned or patterned visual stimuli. Of the 22 components analyzed, six were regarded as electroretinographic, one as myogenic, and the rest as neurogenic. Supplementary analysis revealed that VEP components and their topography are similar whether evoked by unpatterned flashes presented in Maxwellian view, by unpatterned stroboscopic flashes, or by patterned flashes, but not by pattern reversal. Analogous components in the somatosensory, auditory, and visual modalities are examined. S.D.

A77-21947 **A heuristic model for the human vergence eye movement system.** V. V. Krishnan (San Francisco State University, San Francisco, Calif.) and L. Stark (California, University, Berkeley, Calif.). *IEEE Transactions on Biomedical Engineering*, vol. BME-24, Jan. 1977, p. 44-49. 27 refs.

A heuristic feedback system model for the human disparity-vergence eye movements is described. The system has been modeled as a continuous negative feedback system with a modified integral-derivative controller, a time-delay element, and a third-order plant. Simulation studies of the model responses for both step and sinusoidal responses fit the experimentally obtained results. (Author)

A77-21948 **Maximal instantaneous mitral valve velocities measured with a digital echocardiographic tracking system.** R. Emerson, R. Donnerstein, I. Kronzon, M. Schloss, and E. Glassman (New York University, Medical Center, New York, N.Y.). *IEEE Transactions on Biomedical Engineering*, vol. BME-24, Jan. 1977, p. 71-73. 8 refs.

Analysis of the motion of various cardiac structures is attaining increasing clinical significance. By coupling a digital tracking system to a commercially available echocardiograph, continuous position and velocity data from selected intracardiac structures were obtained. This tracking system, which employs a dynamic range gate, has been designed to isolate and lock on to a selected target within the heart. Position of the target is calculated every 8 ms; velocity is obtained by determining the difference between consecutive positions. This system has been used to study mitral valve motion in 20 normal subjects. Maximal instantaneous velocities of the anterior leaflet of the mitral valve were recorded. These instantaneous velocities are to be distinguished from the average velocities obtained by manually measuring the slopes of the curve segments. This system demonstrates a new technique for obtaining more detailed information about the dynamic characteristics of selected cardiac structures. (Author)

A77-21949 **An electrooptical sensor for cardiac sound and vibrations.** S. K. Yeung, S. Yee, and A. Holloway (Washington, University, Seattle, Wash.). *IEEE Transactions on Biomedical Engineering*, vol. BME-24, Jan. 1977, p. 73-75.

An electrooptical sensor for long-term recording of the apex cardiogram in a clinical environment is reported here. The active elements of the sensor include three red light-emitting diodes (LED's) and eight phototransistors. These function by detecting the change in light reflection from the chest wall caused by the mechanical vibrations and motions of the heart. The advantages of this sensor over the existing microphone include wide bandwidth (3.1 Hz-9.0 kHz), small physical size, and ease of attachment to patients in all positions. (Author)

A77-21963 # **Effect of routine treadmill testing on the serum enzymes.** R. A. Chahine, A. Kazantzis, R. J. Luchi, A. E. Raizner, and F. Gyorkey (Baylor University; U.S. Veterans Administration Hospital, Houston, Tex.). *Cardiology*, vol. 61, no. 3, 1976, p. 162-169. 18 refs. U.S. Veterans Administration Grant No. 580-103-0455.

Experiments were conducted on 100 subjects to evaluate enzyme changes following routine treadmill testing in order to assess the validity of enzymes in diagnosis of infarction when the determinations are made in proximity to an exercise test. Another objective was to determine which of the factors duration, physical conditioning, and presence or absence of ischemia may account for whatever changes that may occur during clinical exercise testing. The serum enzymes under analysis were serum glutamic oxalacetic transaminase (SGOT), creatine phosphokinase (CPK), and lactic dehydrogenase (LDH), which were measured before, immediately after, and 4 and 24 hr after exercise. The study demonstrates a slight but statistically significant rise in the serum SGOT and CPK immediately after exercise, the duration of exercise being the most of ballistocardiography in early detection of ischemic heart disease, the estimation of drugs in cardiac disease by noninvasive methods, and recent improvements in noninvasive mechanical techniques. Particular attention is given to time-domain and frequency-domain ballistocardiographic data analysis and to cardiovascular aging. Features topics include assessment of myocardial contractility by invasive and noninvasive methods, a new ULF ballistocardiographic bed, atherosclerosis and cardiovascular aging, and a new method for estimating the volume ratio between pulsatile blood and whole blood in a peripheral site by means of a dye densitograph set with a plethysmograph. S.D.

A77-22104 **An adaptive finite state model of the human operator.** V. K. Jain (Indian Institute of Technology, Kharagpur,

India). *Institution of Electronics and Telecommunication Engineers, Journal*, vol. 22, Nov. 1976, p. 746-750. 16 refs.

A simple closed-loop control system with human operator engaged in compensatory tracking task is considered. An adaptive model for a human operator is proposed in which the compensation portion of the operator's response is identified as the quasi-linear model of McRuer and Krendel. The model takes into account the structure of the nervous system and its information processing capabilities. Essentially, the model consists of a describing function whose parameters depend on external factors, viz. the dynamics of the controlled system, the system input, and other auxiliary variables such as operator's motivation, fatigue, and the like. The adaptive loop operates to make discrete time adjustments in the human operator's parameters through a decision unit. In the proposed model, the information exists in binary coded form and decisions are made by finite state machine. The finite state machine updates the human operator's parameters such that an optimum response of the system is obtained in executing a certain task even in time-varying environmental situations. S.D.

A77-22148 **An indirect measure of perceived distance from oculomotor cues.** W. C. Gogel (California, University, Santa Barbara, Calif.). *Perception and Psychophysics*, vol. 21, Jan. 1977, p. 3-11. 10 refs. Grant No. PHS-MH-15651.

A previous paper by Gogel and Newton (1976) has described an indirect method called the adjustable pivot method, in which the distance of the point around which the direction from the observer to the object pivots as the observer moves his head laterally is varied systematically. The present study compares the verbal report and the adjustable pivot methods of measuring perceived distance in a situation in which the perceived distance of the object from the observer (perception of egocentric distance) is varied by changing the oculomotor cues of distance (accommodation and convergence of the eyes). Two kinds of verbal reports are used: one consists of the unmodified reports of apparent distance, and the other results from calibrating the unmodified verbal reports of distance by distance judgements obtained from the same observer in a full-cue situation. Major conclusions are that oculomotor cues (probably convergence) are effective cues for distances near the observer, that oculomotor cues are much more effective than familiar size in determining perceived distance, and that the adjustable pivot method is a sensitive and useful procedure for measuring perceived distance under conditions where differences in perceived distance were expected to occur. S.D.

A77-22149 * **Adaptation to visual and proprioceptive rearrangement - Origin of the differential effectiveness of active and passive movements.** J. R. Lackner (Brandeis University, Waltham, Mass.). *Perception and Psychophysics*, vol. 21, Jan. 1977, p. 55-59. 29 refs. Research supported by the Rosenstiel Biomedical Sciences Foundation and Spenser Foundation; Grant No. NGR-22-009-308.

Experiments were conducted to measure and compare the accuracy with which subjects pointed to visual targets before and after an exposure period in which they received systematic proprioceptive misinformation about the locations of visual targets. The crucial factor determining whether adaptation will be elicited is shown to be the presence of a discordance in the positional information being conveyed over two different sensory modalities. Another experiment was carried out to study the effectiveness of active and passive movements in eliciting adaptation when the subjects were exposed to a systematic discordance between the visual and proprioceptive locations of external targets without being permitted sight of their hands. Superiority of active over passive movements in producing adaptation to visual rearrangement is due to the greater accuracy of position sense information about voluntarily moved limbs, partly derived from the contribution of muscle afferent signals. S.D.

A77-22150 **Eye-position aftereffects of backward head tilt manifested by illusory visual direction.** W. L. Shebilske and L. A. Fogelgren (Virginia, University, Charlottesville, Va.). *Perception and Psychophysics*, vol. 21, Jan. 1977, p. 77-82. 19 refs.

A77-22364 **Perceived exertion of absolute work during a military physical training program.** J. F. Patton, W. P. Morgan, and J. A. Vogel (U.S. Army, Research Institute of Environmental Medicine, Natick, Mass.). *European Journal of Applied Physiology*, vol. 36, no. 2, 1977, p. 107-114. 16 refs.

The experimental design used in this study consisted of two periods of physiological-perceptual testing separated by a six-month period. During the first testing phase, two groups of 60 male military personnel aged 17-35 yr were evaluated on a cross-sectional basis. Group I represented a sample of unselected subjects who had not as yet participated in the physical training program. Group II represented randomly selected personnel who had been participating in the training program for a period of 5-6 months. The second testing phase consisted of a six-month longitudinal follow-up of the original two groups; groups I and II had therefore been participating in the training program for 6 and 11 months, respectively. During the last 15 sec of each minute of the 6-min absolute work-load, the heart rate was recorded and the subjects were asked to give a rating of perceived exertion according to a psychophysical scale. Results suggest that the perception of the intensity of absolute work does not differ in groups differing in their level of fitness when studied cross-sectionally. However, significant reduction in perceived exertion occurs following physical training. S.D.

A77-22365 **Heart rate and ventilation in relation to venous potassium ion concentration, osmolality, pH, PCO2, PO2, orthophosphate concentration, and lactate concentration at transition from rest to exercise in athletes and non-athletes.** U. Tibes, B. Hemmer, and D. Böning (Deutsche Sporthochschule, Cologne, West Germany). *European Journal of Applied Physiology*, vol. 36, no. 2, 1977, p. 127-140. 42 refs. Research supported by the Bundesinstitut für Sportwissenschaft.

Time courses of cubital and femoral venous potassium ion concentration, osmolality, pH, PCO2, PO2, lactate concentration, and orthophosphate concentration were measured in trained and untrained subjects at onset of exercise and compared to time courses of the heart rate and minute ventilation. Two cases were studied: ischemic and nonischemic work. It is shown that during ischemic work most of the cited blood constituents are only released from the contracting muscles with substantial increases in the heart rate and minute ventilation. In the case of nonischemic work, only increases in femoral venous potassium ion concentration mimicked the cardiorespiratory transients in both the trained and untrained subjects. It is suggested that cardiorespiratory adjustment in the initial stage of work is related to potassium ion concentration in the contracting muscles. S.D.

A77-22366 **Estimation of body density and lean body weight from body measurements at high altitude.** H. Bharadwaj, S. S. Verma, T. Zachariah, M. R. Bhatia, S. Kishnani, and M. S. Malhotra (Defence Institute of Physiology and Allied Sciences, Delhi, India). *European Journal of Applied Physiology*, vol. 36, no. 2, 1977, p. 141-150. 23 refs.



1 6 7 M Y 7 7 UMI

A77-22396 **Color vision in the peripheral retina. I - Spectral sensitivity. II - Hue and saturation.** I. Abramov (Brooklyn College, Brooklyn; Rockefeller University, New York, N.Y.) and J. Gordon (Hunter College; Rockefeller University, New York, N.Y.). *Optical Society of America, Journal*, vol. 67, Feb. 1977, p. 195-207. 32 refs. NSF Grant No. BMS-72-02435A02; Grant No. NIH-EY-188.

A77-22397 **Spatial frequency and light-spread descriptions of visual acuity and hyperacuity.** G. Westheimer (California, University, Berkeley, Calif.). *(Optical Society of America, Annual Meeting, Tucson, Ariz., Oct. 18-22, 1976.) Optical Society of America, Journal*, vol. 67, Feb. 1977, p. 207-212. 10 refs. Grant No. NIH-EY-00220.

Resolution (visual acuity) and differential spatial localization (hyperacuity) targets were selected to allow rigorous psychophysical measurements as well as ready expression of both their spatial frequency spectrum and their retinal image light distribution. Thresholds were about 1 arcmin for acuity and 4-6 arcsec for hyperacuity. As is consistent with the reciprocal relationship of ballistocardiography in early detection of ischemic heart disease, the estimation of drugs in cardiac disease by noninvasive methods, and recent improvements in noninvasive mechanical techniques. Particular attention is given to time-domain and frequency-domain ballistocardiographic data analysis and to cardiovascular aging. Features topics include assessment of myocardial contractility by invasive and noninvasive methods, a new ULF ballistocardiographic bed, atherosclerosis and cardiovascular aging, and a new method for estimating the volume ratio between pulsatile blood and whole blood in a peripheral site by means of a dye densitograph set with a plethysmograph. S.D.

A77-22707 **Trace elements and the panspermia hypotheses.** D. M. Gualtieri (Pittsburgh, University, Pittsburgh, Pa.). *Icarus*, vol. 30, Jan. 1977, p. 234-238. 12 refs.

The modal concentrations of elements in four representative classes of organisms, namely bacteria, fungi, plants, and land animals, are compared with the concentrations of the elements in sea water. A strong correlation is found between these concentrations, and this correlation reduces to an expected linear concentration law when only "trace" elements are considered. Deviations from strict linearity are shown to arise from the chemical natures of the elements. Apart from suggesting an oceanic genesis for terrestrial life, the data are strongly against a nonterrestrial origin of life as proposed by the panspermia hypotheses. (Author)

A77-22739 **Analysis of color and its effectiveness.** R. E. Christ (New Mexico State University, Las Cruces, N. Mex.). In: Advanced Aircrew Display Symposium, 3rd, Patuxent River, Md., May 19, 20, 1976, Proceedings. Patuxent River, Md., U.S. Naval Air Systems Command, Naval Air Test Center, 1976, p. 380-392.

The results of the research program described indicate that color is most likely to benefit performance of a test subject in any task involving complex multiple stimulus formats and in distinguishing one class of stimuli (e.g., one stimulus dimension) from another. Color appears to aid the subject in the requirement for organizing or reorganizing inputs from the display. The results emphasize the importance of practice with any coding variable and with any task. V.P.

A77-22747 **Echocardiographic assessment of left ventricular function in coronary arterial disease.** P. A. N. Chandraratna, A. Rashid, A. Tolentino, F. J. Hildner, A. Fester, P. Samet, B. B. Littman, and S. Sabharwal (Mount Sinai Medical Center, Miami Beach; Miami, University, Coral Gables, Fla.). *British Heart Journal*, vol. 39, Feb. 1977, p. 139-144. 16 refs.

Echocardiography was performed on 43 patients who underwent cardiac catheterization for symptomatic coronary arterial disease in order to determine whether an increase in the echocardiographic ventricular dimension reflects a critical reduction of the ventricular ejection fraction calculated by the area length method. Patients with mitral regurgitation were excluded from the study, and the echocardiograms were performed within 24 hr of the catheterization studies. Single-plane ventriculograms were used in determining ventricular volumes and ejection fraction. It is shown that enlargement of the echocardiographic left-ventricular end-diastolic dimension index is usually associated with a critical reduction of the ventriculographic ejection fraction. In particular, since patients with compromised ventricular function are not ideal candidates for aortocoronary saphenous vein graft surgery, the ability to predict a poor ejection fraction by a noninvasive method such as echocardiography is of substantial prognostic value. S.D.

A77-22770 **Long-wavelength analysis of plane wave irradiation of an ellipsoidal model of man.** H. Massoudi, C. H. Durney, and C. C. Johnson (Utah, University, Salt Lake City, Utah). *IEEE Transactions on Microwave Theory and Techniques*, vol. MTT-25, Jan. 1977, p. 41-46. 9 refs. USAF-supported research.

Expressions are derived for the induced electric fields in an ellipsoidal model of man and experimental animals irradiated by an electromagnetic (EM) plane wave when the wavelength is long compared with the dimensions of the ellipsoid. Calculations of the power absorbed by an ellipsoidal model of man are given for six different orientations of the ellipsoid with respect to the incident plane-wave field vectors. The results show that the induced fields and the absorbed power in the ellipsoid are strong functions of frequency, size, and orientation with respect to the incident EM field vectors. The results for the ellipsoidal model of man are also compared with those of the prolate spheroidal model. (Author)

A77-22771 **Long-wavelength electromagnetic power absorption in ellipsoidal models of man and animals.** H. Massoudi, C. H. Durney, and C. C. Johnson (Utah, University, Salt Lake City, Utah). *IEEE Transactions on Microwave Theory and Techniques*, vol. MTT-25, Jan. 1977, p. 47-52. 20 refs. USAF-supported research.

A previously developed long-wavelength analysis is applied to ellipsoidal models of humans and experimental animals to obtain the distribution of tissue power absorption and average power absorption for different frequencies and orientations of the model with respect to the field vectors. Curves showing the distribution of absorbed power inside the model and the average absorbed power versus frequency are presented for several species. Comparisons of calculated data with preliminary experimental data on monkeys are given. The theoretical results show that the power absorption in the ellipsoidal model is a strong function of frequency and orientation with respect to the incident plane-wave field vectors. The quantitative data presented are valuable for estimating tissue electromagnetic (EM) power absorption in experimental animals and humans. These data may also be used in extrapolating EM-induced effects measured in animals to those expected in humans. (Author)

A77-22857 **Non-invasive mechanical methods in cardiology and cardiovascular dynamics; Proceedings of the Fourth World Congress on Ballistocardiography and Cardiovascular Dynamics, Amsterdam, Netherlands, April 14-16, 1975.** Congress supported by

Merck Sharp and Dohme. Edited by W. J. A. Goedhard (Amsterdam, Vrije Universiteit, Amsterdam, Netherlands). Basel, S. Karger AG (Bibliotheca Cardiologica, No. 35), 1976. 290 p. $54.75.

Results are presented for studies regarding the relationship between invasive and noninvasive cardiovascular data, the evaluation between the space and spatial frequency domains, the small locally restricted spatial differences between just distinguishable patterns are represented in the frequency domain by equally small differences, which are distributed over the entire spatial frequency spectrum. While they occur in many test situations, phase variations of spatial frequency components are not necessary for achieving optimum acuity and hyperacuity. (Author)

A77-22859 **Circadian rhythms in step-input pursuit tracking.** L. Buck (National Research Council, Control Systems Laboratory, Ottawa, Canada). *Ergonomics*, vol. 20, Jan. 1977, p. 19-31. 15 refs.

Subjects performed a step-input pursuit tracking task at regular intervals over two days. Performance varied with time of day in a manner and to an extent dependent upon the choice of index so that circadian rhythms for speed scores were in inverse phase with those for accuracy scores. Presence or absence of knowledge of results made no significant difference to the time of day effect but increased short term memory demands disturbed the movement time rhythm supporting the hypothesis that psychomotor and short term memory functions vary in inverse phase with time of day. (Author)



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# STAR ENTRIES

N77-16678 Texas Univ. Health Science Center, Houston.
**MATHEMATICAL MODELLING METHODS IN RADIO BIOLOGY Ph.D. Thesis**
Jerry Wayne McLarty 1976 127 p
Avail: Univ Microfilms Order No. 76-29062

The use of mathematical models to approximate the response of biological systems to irradiation is examined. In addition to the usual treatment of absorbed dose, the time, dose and multiport fractionation schedules are considered stimulus variables. An analysis of the mathematical properties of several common models is presented and the regression of these models to radiobiological data is examined. A parametric method for the estimation of dose-modifying factors is developed and shown to be an improvement in certain respects over previously available methods. The extension of cell survival models to represent the effects of repair and repopulation between fractions is developed and the problems in estimation of age-response characteristics of cells from partially synchronized populations are investigated. The well-known NSD model, its relationship to other models and the problems in applying it to clinical data are discussed in detail. A generalized method for the comparison of multiport fractionation schedules and the interschedule conversion is developed. Dissert. Abstr.

N77-16679*# Fermentation Design, Inc., Bethlehem, Pa.
**SPACE BIOSYNTHESIS SYSTEMS Final Report, Apr. - Oct. 1976**
L. K. Nyiri and Gizella M. Toth 1 Nov. 1976 203 p refs
(Contract NAS9-14961)
(NASA-CR-151166; Rept-102110176FD) Avail: NTIS HC A10/MF A01 CSCL 06M

Model reactions based on chemical, enzymatic or cellular conversion of D glucose into d gluconic acid are designed to unequivocally define the advantages of microgravity on reaction mechanisms, mass-transfers and separation of organic chemicals and to serve as procedures to test the performance characteristics of space bioprocessing equipment. Author

N77-16680*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
**MICROBIAL LOAD MONITOR Interim Report**
J. T. Holen and Eugene R. Royer 1 Mar. 1976 51 p
(Contract NAS9-11877)
(NASA-CR-151172; MDC-E1461; IR-3) Avail: NTIS HC A04/MF A01 CSCL 06B

A card configuration which combines the functions of identification, enumeration and antibiotic sensitivity into one card was developed. An instrument package was designed around the card to integrate the card filling, incubation reading, computation and decision making process into one compact unit. Support equipment was also designed to prepare the expandable material used in the MLM. Author

N77-16681*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**SPECIFICATIONS FOR AND PRELIMINARY DESIGN OF A PLANT GROWTH CHAMBER FOR ORBITAL EXPERIMENTAL EXPERIMENTS**
Haven C. Sweet (Florida Technol. Univ.) and Richard C. Simmonds Aug. 1976 30 p refs
(NASA-TM-X-73189; A-6851) Avail: NTIS HC A03/MF A01 CSCL 06B

It was proposed that plant experiments be performed on board the space shuttle. To permit the proper execution of most tests, the craft must contain a plant growth chamber which is adequately designed to control those environmental factors which can induce changes in a plant's physiology and morphology. The various needs of, and environmental factors affecting, plants are identified. The permissilbe design, construction and performance limits for a plant-growth chamber are set, and tentative designs were prepared for units which are compatible with both the botanical requirements and the constraints imposed by the space shuttle. Author

N77-16682# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
**AN AXISYMMETRIC HARMONIC MIXED-BOUNDARY-VALUE PROBLEM**
D. H. Ferriss Jul. 1976 19 p refs
(NPL-NAC-67) Avail: NTIS HC A02/MF A01

An axisymmetric mixed-boundary-value problem arising in the theory of oxygen diffusion in tissue is shown to be equivalent to the determination of the capacitance of an electrified disc between earthed parallel plates when more than one material is present in the form of parallel layers. The problem is formulated in terms of a pair of dual integral equations, converted into a Fredholm integral equation of the second kind and solved numerically by a Chebyshev series technique. Author (ESA)

N77-16683# Interuniversitair Reactor Instituut, Delft (Netherlands).
**BINDERS OF INTRAVENOUSLY ADMINISTERED 65-ZINC IN RAT LIVER CYTOPLASM**
A. J. Stortenbeek and C. J. A. vandenHamer 1976 24 p refs Submitted for publication
(IRI-33-76-02) Avail: NTIS HC A02/MF A01

The fate of an intravenously injected trace dose of Zn-65(2+) in the rat was studied over a period of 10 days after injection. Tissue distributions were determined and a special study was made of Zn-65 binders in liver cytoplasm with apparent molecular weights of about 113,000, 66,400, 47,400, 29,000, 23,000, and 11,400. A time study showed that 4 hr after the injection, the most prominent cytoplasmatic Zn-65 binders are the 133,000, 66,400, and 23,000 molecular weight fractions. A tentative identification of the main Zn binders in the six Zn-65 fractions is given, using the collected data regarding their apparent molecular weight, time dependent prominence, and content of stable Zn. Author (ESA)

N77-16684# Interuniversitair Reactor Instituut, Delft (Netherlands).
**EXTENDED AUTOMATED SEPARATION TECHNIQUES IN DESTRUCTIVE NEUTRON ACTIVATION ANALYSIS: APPLICATION TO VARIOUS BIOLOGICAL MATERIALS, INCLUDING HUMAN TISSUES AND BLOOD**
P. S. Tjioe, J. J. M. deGoeij, and J. P. W. Houtman 1976 12 p refs Presented at the 1976 Intern. Conf. on Mod. Trends in Activation Analysis, Munich, 13-17 Sep. 1976
(IRI-133-76-11) Avail: NTIS HC A02/MF A01

A chemical separation consisting of automated procedures for destruction, distillation, and anion-chromatography is described. The system developed allows the determination of 14 trace elements in biological materials, viz antimony, arsenic, bromine, cadmium, chromium, cobalt, copper, gold, iron, mercury, molybdenum, nickel, selenium, and zinc. The aspects of sample preparation, neutron irradiation, gamma spectrum evaluation, and blank-value contribution are also discussed. ESA

N77-16685* Society of Photo-Optical Instrumentation Engineers, Palos Verdes Estates, Calif.

**CARDIOVASCULAR IMAGING AND IMAGE PROCESSING: THEORY AND PRACTICE, 1975**

Donald C. Harrison, ed. (Stanford Univ., Calif.), Harold Sandler, ed. (NASA Ames Research Center, Calif.), and Harry A. Miller, ed. (Stanford Univ., Calif.) 1975 375 p refs Conf. Proc. held at Stanford, Calif., Jul. 1975; sponsored by NASA, JPL and Stanford Univ. School of Medicine Sponsored in part by NASA (NASA-CR-149387; LC-75-45828; ISBN-0-89252-084-1)

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Ultrasonography was examined in regard to the developmental highlights and present applicatons of cardiac ultrasound. Doppler ultrasonic techniques and the technology of miniature acoustic element arrays were reported. X-ray angiography was discussed with special considerations on quantitative three dimensional dynamic imaging of structure and function of the cardiopulmonary and circulatory systems in all regions of the body. Nuclear cardiography and scintigraphy, three--dimensional imaging of the myocardium with isotopes, and the commercialization of the echocardioscope were studied.

**N77-16686*** Stanford Univ., Calif. Cardiology Div.

**TUTORIAL: DEVELOPMENTAL HIGHLIGHTS AND PRESENT APPLICATIONS OF CARDIAC ULTRASOUND**

Richard L. Popp *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 3-8

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Current applications of ultrasound for cardiac imaging are reviewed. Display methods and modes are discussed in detail. Instrumentation and limitations are summarized. B.B.

**N77-16687*** Erasmus Univ., Rotterdam (Netherlands). Dept. of Echocardiography.

**THE TECHNOLOGY OF MINIATURE ACOUSTIC ELEMENT ARRAYS**

N. Bom, C. T. Lancee, J. Ridder, C. Ligtvoet, and J. Roelandt *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 11-15 refs

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Various aspects of miniature element array construction are discussed. Some initial results on optimization of lateral resolution with a special focusing technique in linear array design is presented, together with the constructional details. Furthermore the construction of a catheter tip array is treated in detail.

Author

**N77-16688** Stanford Univ., Calif. Center for Integrated Electronics in Medicine.

**ULTRASONIC IMAGING USING TWO-DIMENSIONAL TRANSDUCER ARRAYS**

W. L. Beaver, M. G. Maginness, J. D. Plummer, and J. D. Meindl *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 17-23 refs

(Grant BM-17940)

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Ultrasonic real time imaging methods using two dimensional transducer arrays are examined. A three dimensional A or B mode sector scan, whose application is a natural extention of echocardiographic methods is produced using the pulse echo transmit receive array system. The array is either multiplexed and acoustically focused, or electronically phased to produce deflection and focusing of the acoustic beam in both transmission and reception. B.B.

**N77-16689*** National Heart and Lung Inst., Bethesda, Md. Cardiology Branch and Biomedical Engineering and Instrumentation Div.

**SECTOR-SCANNING ECHOCARDIOGRAPHY**

Walter L. Henry and James M. Griffith *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 25-29 refs

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The mechanical sector scanner is described in detail, and its clinical application is discussed. Cross sectional images of the heart are obtained in real time using this system. The sector scanner has three major components: (a) hand held scanner, (b) video display, and (c) video recorder. The system provides diagnostic information in a wide spectrum of cardiac diseases and it quantitates the severity of mitral stenosis by measurement of the mitral valve orifice area in diagnosing infants, children and adults with cyanotic congenital heart disease. B.B.

**N77-16690** Stanford Research Inst., Menlo Park, Calif.

**POTENTIAL OF REAL-TIME ORTHOGRAPHIC ULTRASONIC IMAGING FOR CARDIOVASCULAR DIAGNOSIS**

Philip S. Green and Kenneth W. Marich *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 31-35 refs

(Grant GM-18780)

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Preliminary transmission imaging studies were conducted using both laboratory and clinical instruments, to demonstrate the potential feasibility of using this technique for cardiovascular applications. A wide selection of tissues and organs were examined in both in vitro and in vivo imaging studies. In vivo visualization of superficial blood vessels in the arm and leg was easily accomplished in both children and adults. Author

**N77-16691*** Stanford Univ., Calif. Cardiology Div.

**COMPUTER PROCESSING OF ECHOCARDIOGRAPHIC IMAGES**

William J. Sanders and Donald C. Harrison *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 37-43 refs

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Systems for direct computer acquisition of the echo signal and subsequent computerized echocardiogram image processing were constructed. Such systems were used to generate images unobtainable by other techniques and to automatically perform quantitative measurements of cardiac structures (5,6,7). The techniques used in analyzing echocardiograms are discussed, and the complexity of the problems involved is illustrated. A description of how these problems may be solved is included. Author

**N77-16692** Duke Univ., Durham, N.C.

**DYNAMIC CARDIAC IMAGING USING A PHASED-ARRAY TRANSDUCER SYSTEM**

Joseph Kisslo, Olaf vonRamm, and Frederick L. Thurstone *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 45-49

(Grants HL-12715; HL-14228; HL-17670-01; HS-01613)

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The design considerations, performance characteristics and initial clinical results of a high resolution, real time, two dimensional ultrasound sector scanner designed specifically for cardiac use is described. Such a system relies upon phased array principles rather than mechanical means, to steer the sound beam through the target volume. Author

**N77-16693*** Stanford Univ., Calif. Integrated Circuits Lab.

**DOPPLER INSTRUMENTATION FOR MEASURING BLOOD VELOCITY AND FLOW**

Robert W. Gill, Charles F. Hottinger, and James D. Meindl *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 53-63 refs

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Doppler ultrasonic blood flowmeters are reviewed in detail. The importance of measurement accuracy for transcutaneous flowmeters and their clinical application is stressed. Doppler imaging was combined with conventional pulse echo imaging and diagnostic information was extracted from flow signals. The range and extent of applications of Doppler instruments was also presented. B.B.



1 6 7 M Y 7 7 UMI

N77-16694* Iowa Univ., Iowa City. Peripheral Vascular Labs.
**APPLICATIONS OF DOPPLER ULTRASOUND IN CLINICAL VASCULAR DISEASE**
R. W. Barnes, D. E. Hokanson, D. S. Sumner, and D. E. Strandness, Jr. *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 65-72 refs Prepared in cooperation with Veterans Administration Hospital, Seattle, Wash.
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Doppler ultrasound has become the most useful and versatile noninvasive technique for objective evaluation of clinical vascular disease. Commercially available continuous-wave instruments provide qualitative and quantitative assessment of venous and arterial disease. Pulsed Doppler ultrasound was developed to provide longitudinal and transverse cross-sectional images of the arterial lumen with a resolution approaching that of conventional X-ray techniques. Application of Doppler ultrasound in venous, peripheral arterial, and cerebrovascular diseases is reviewed.
Author

N77-16695* Institute of Applied Physiology and Medicine, Seattle, Wash.
**PROCESSING AND DISPLAY TECHNIQUES FOR DOPPLER FLOW SIGNALS**
John M. Reid *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular imaging and image processing 1975 p 73-78 refs
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The goals of various processing and display techniques are derived from the Doppler spectrum. A meaningful measure of flow phenomenon was investigated, and this measure was presented to an operator. Important measures went beyond indication of velocity of flow or volume flow and included indications of the type of flow, i.e., laminar or turbulent, as well as geometric parameters such as depth, width or cross sectional area of the flow stream.
Author

N77-16696* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**TUTORIAL: ANCIOCARDIOGRAPHY, PAST AND PRESENT**
Harold Sandler *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 83-93 refs
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The contribution of X-ray methodology and angiocardiography in the ability to study cardiac and cardiovascular function is presented. Angiocardiography remains the most reliable method for determination of overall chamber size and shape particularly in the face of disease states of varying etiologies. It also presents the most accurate means for obtaining dimensional information concerning the heart and blood vessels without the use of surgery or attachment of transducers.
Author

N77-16697* Mayo Foundation, Rochester, Minn. Biophysical Sciences Unit.
**QUANTITATIVE THREE-DIMENSIONAL DYNAMIC IMAGING OF STRUCTURE AND FUNCTION OF THE CARDIOPULMONARY AND CIRCULATORY SYSTEMS IN ALL REGIONS OF THE BODY**
R. E. Sturm, E. L. Ritman, and E. H. Wood *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 103-122 refs

(Grant NGR-24-003-001; Contract F44620-71-C-0069; Grant HL-04664)
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The background for, and design of a third generation, general purpose, all electronic spatial scanning system, the DSR is described. Its specified performance capabilities provide dynamic and stop action three dimensional spatial reconstructions of any portion of the body based on a minimum exposure time of 0.01 second for each 28 multiplanar 180 deg scanning set, a maximum scan repetition rate of sixty 28 multiplane scan sets per second, each scan set consisting of a maximum of 240 parallel cross sections of a minimum thickness of 0.9 mm, and encompassing a maximum cylindrical volume about 23 cm in length and up to 38 cm in diameter.
Author

N77-16698* Iowa State Univ. of Hospitals and Clinics, Iowa City. Cardiovascular Center.
**SINGLE PLANE ANGIOGRAPHY: CURRENT APPLICATIONS AND LIMITATIONS**
Herman L. Falsetti and Robyn J. Carroll *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 123-127 refs

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Technical errors in measurement of one plane cineangiography are identified. Examples of angiographic estimates of left ventricular geometry are given. These estimates of contractility are useful in evaluating myocardial performance.
Author

N77-16699* Mayo Foundation, Rochester, Minn. Biophysical Sciences Unit.
**REGIONAL MYOCARDIAL SHAPE AND DIMENSIONS OF THE WORKING ISOLATED CANINE LEFT VENTRICLE**
Erik L. Ritman, Kai Tsuiki, David Donald, and Earl H. Wood *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 129-137 refs

(Grants NGR-24-003-001; NIH-HL-04664)
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The extent to which the dynamic shape and dimensions of the isolated left ventricular myocardial wall differ throughout the myocardium and how these differences are characteristic of the anatomic location was demonstrated. The use of a biplane X-ray technique and a metabolically-supported isolated canine left ventricle preparation provided an angiographically ideal means of measuring mechanical dynamics of the myocardium while the intact left ventricular myocardial structure and electrical activation pattern retains most of the in situ ventricular characteristics.
Author

N77-16700* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**REAL-TIME DETECTION AND DATA ACQUISITION SYSTEM FOR THE LEFT VENTRICULAR OUTLINE**
Johan H. C. Reiber *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 139-147 refs
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A data acquisition system for the left ventricular outline which has potential for online use is described and basic principles of the contour detector are presented in detail. It is concluded that the data acquisition system for real time, online detection of left ventricular outlines has many advantages over presently used manual or semi-automatic procedures in a clinical investigative environment.
B.B.

N77-16701* California Univ., San Diego. Dept. of Radiology.
**ACQUISITION OF QUANTITATIVE PHYSIOLOGICAL DATA AND COMPUTERIZED IMAGE RECONSTRUCTION USING A SINGLE SCAN TV SYSTEM**
Norman A. Baily *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 149-156 refs
(Grants NGR-05-009-257; HL-14169)
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Single scan operation of television X-ray fluoroscopic systems allow both analog and digital reconstruction of tomographic sections from single plan images. This type of system combined with a minimum of statistical processing showed excellent capabilities for delineating small changes in differential X-ray attenuation. Patient dose reduction is significant when compared to normal operation or film recording. Flat screen, low light level systems were both rugged and light in weight, making them applicable for a variety of special purposes. Three dimensional information was available from the tomographic methods and

the recorded data was sufficient when used with appropriate computer display devices to give representative 3D images.
Author

**N77-16702*** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
**DIGITAL IMAGE PROCESSING OF VASCULAR ANGIOGRAMS**
R. H. Selzer, D. H. Blankenhorn (Univ. of Southern Calif., Los Angeles), E. S. Beckenbach, D. W. Crawford (Univ. of Southern Calif., Los Angeles), and S. H. Brooks (Univ. of Southern Calif., Los Angeles) *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 159-162

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A computer image processing technique was developed to estimate the degree of atherosclerosis in the human femoral artery. With an angiographic film of the vessel as input, the computer was programmed to estimate vessel abnormality through a series of measurements, some derived primarily from the vessel edge information and others from optical density variations within the lumen shadow. These measurements were combined into an atherosclerosis index, which was found to correlate well with both visual and chemical estimates of atherosclerotic disease.
Author

**N77-16703** Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
**ALGORITHMS FOR RECONSTRUCTION**
A. C. Kak *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 163-176 refs

(Contract F30602-75-C-0150)

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Many different algorithms were discussed for solving the problem of digitally reconstructing the image of the internal structure of an object from measurements of its dimensional projections, resulting from transmission of radiation through the object. Most of them fall into three categories: (1) the Fourier methods, (2) the convolution or the filtered back-projection methods, and (3) the algebraic methods. The Fourier methods are based on the fact that a cross-section of Fourier transform of a two dimensional pattern is equal to the Fourier transform of the projection of the pattern in a direction perpendicular to that cross-section. The convolutional techniques also make use of the Fourier transform property but can be efficiently implemented entirely in the signal space. The algebraic reconstruction technique consists of approximating the cross-section, for which the tomographic image is desired, by an NxN discrete pattern.
Author

**N77-16704*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**COMPUTER MEASUREMENT AND REPRESENTATION OF THE HEART IN TWO AND THREE DIMENSIONS**
Daryl Rasmussen *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 177-182 refs

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Methods for accurate measurement and meaningful display of cardiac dimensions as obtained from fluoroscopy were surveyed. Recorded images were scaled back to actual dimensions and cardiac motion was displayed to assess functional changes. This was accomplished by use of a low-cost but flexible ensemble of computer and video equipment which assisted in (1) digitizing image outlines or points, (2) filing digitized images for later recall in any sequence, (3) correcting recorded images for distortion, (4) modeling heart geometry, (5) analyzing dimensional changes, and (6) displaying both heart geometry and results of analysis in a useful form.
Author

**N77-16705*** Mayo Foundation, Rochester, Minn. Biophysical Sciences Unit.
**THREE-DIMENSIONAL RECONSTRUCTION AND DISPLAY OF THE HEART, LUNGS AND CIRCULATION BY MULTIPLANAR X-RAY SCANNING VIDEODENSITOMETRY**
Richard A. Robb, Erik L. Ritman, and Earl H. Wood *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 183-194 refs

(Grant NGR-24-003-001; Contract F44620-71-C-0069; Grants HL-04664; HL-0234; AHA-CI-10)

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A device was developed which makes possible the dynamic reconstruction of the heart and lungs within the intact thorax of a living dog or human and which can record approximately 30 multiplanar X-ray images of the thorax practically instantaneously, and at frequent enough intervals of time and with sufficient density and spatial resolution to capture and resolve the most rapid changes in cardiac structural detail throughout each cardiac cycle. It can be installed in a clinical diagnostic setting as well as in a research environment and its construction and application for determination and display in real-time modes of cross sections of the functioning thorax and its contents of living animals and man is technologically feasible.
Author

**N77-16706*** Duke Univ., Durham, N.C. Medical Center.
**COMPUTER STORAGE AND RETRIEVAL OF CORONARY TREES**
C. Frank Starmer and W. M. Smith *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 195-199

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Coronary cineangiography is a routine procedure for evaluation of the coronary circulation. From the biplane cineangiograms a visual representation of coronary perfusion was obtained. A collection of simple ideas and procedures to aid in the collection is described. The uses to which the tree data will be put include the evaluation of myocardial function and the formation of a library sufficiently large to enable some taxonomic classification of coronary artery patterns to be made.
Author

**N77-16707*** Medical Coll. of Ohio, Toledo. Div. of Cardiology.
**CLINICAL APPLICATIONS OF A QUANTITATIVE ANALYSIS OF REGIONAL LIFT VENTRICULAR WALL MOTION**
Richard F. Leighton, John M. Rich, Mary E. Pollack, and Pablo I. Altieri *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 203-208 refs Sponsored in part by NIH

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Observations were summarized which may have clinical application. These were obtained from a quantitative analysis of wall motion that was used to detect both hypokinesis and tardokinesis in left ventricular cineangiograms. The method was based on statistical comparisons with normal values for regional wall motion derived from the cineangiograms of patients who were found not to have heart disease.
Author

**N77-16708*** Stanford Univ., Calif. Cardiology Div.
**CLINICAL APPLICATION OF A LIGHT-PEN COMPUTER SYSTEM FOR QUANTITATIVE ANGIOGRAPHY**
Edwin L. Alderman *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 209-216 refs Sponsored in part by NIH

(Grant NGL-05-020-305)

Avail: Issuing Activity CSCL 06B

The important features in a clinical system for quantitative angiography were examined. The human interface for data input, whether an electrostatic pen, sonic pen, or light-pen must be engineered to optimize the quality of margin definition. The computer programs which the technician uses for data entry and computation of ventriculographic measurements must be convenient to use on a routine basis in a laboratory performing multiple studies per day. The method used for magnification correction must be continuously monitored.
Author

**N77-16709*** Washington Univ., Seattle. Div. of Cardiology.
**QUANTITATIVE ANALYSIS OF REGIONAL MYOCARDIAL**

**PERFORMANCE IN CORONARY ARTERY DISEASE**

Douglas K. Stewart, Harold T. Dodge, and Morris Frimer *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 217-224 refs Sponsored by NIH

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Findings from a group of subjects with significant coronary artery stenosis are given. A group of controls determined by use of a quantitative method for the study of regional myocardial performance based on the frame-by-frame analysis of biplane left ventricular angiograms are presented. Particular emphasis was placed upon the analysis of wall motion in terms of normalized segment dimensions, timing and velocity of contraction. The results were compared with the method of subjective assessment used clinically. Author

N77-16710* Mayo Clinic, Rochester, Minn.

**MYOCARDIAL BLOOD FLOW: ROENTGEN VIDEODENSITOMETRY TECHNIQUES**

Hugh C. Smith, Richard A. Robb, and Earl H. Wood *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 225-232 refs

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The current status of roentgen videodensitometric techniques that provide an objective assessment of blood flow at selected sites within the coronary circulation were described. Roentgen videodensitometry employs conventional radiopaque indicators, radiological equipment and coronary angiographic techniques. Roentgen videodensitometry techniques developed in the laboratory during the past nine years, and for the past three years were applied to analysis of angiograms in the clinical cardiac catheterization laboratory. Author

N77-16711* Rancho Los Amigos Hospital, Inc., Downey, Calif.

**COMPUTER ANALYSIS OF FEMORAL ANGIOGRAMS FOR EVALUATION OF ATHEROSCLEROSIS IN POST-INFARCT MALES-CLINICAL CORRELATES**

Miguel E. Sanmarco and David H. Blankenhorn *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 233-239 refs

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Femoral artery atheromatous lesions were studied and their changes as a measure of therapeutic effectiveness were assessed. The incidence of coronary risk factors in 100 patients was determined. Abnormal cholesterol was present in 42 percent, abnormal triglycerides in 66 percent, abnormal intravenous glucose tolerance test in 52 percent, judged from a K value of .9 or less by the technique of Wahlbert. A history of high blood pressure was present in 32 percent. Smoking was one of the most common factors. Author

N77-16712* Stanford Univ., Calif. Cardiology Div.

**NUCLEAR CARDIOGRAPH AND SCINTIGRAPHY**

Peter McLaughlin *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 245-260 refs

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Extensive advances in the technology of detectors, data analysis systems, and tracers used have resulted in greatly expanded applications of radioisotopes to the assessment of cardiac function and disease. The development of nuclear cardiology has proceeded along four lines: (1) radionuclide angiography, (2) myocardial perfusion imaging, (3) intracoronary microsphere imaging, and (4) regional myocardial blood flow determination using inert gases. Author

N77-16713* California Univ., Berkeley. Lawrence Berkeley Lab. Donner Lab.

**THREE-DIMENSIONAL IMAGING OF THE MYOCARDIUM WITH ISOTOPES**

T. F. Budinger *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 263-271 refs Sponsored in part by NIH and ERDA

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Three methods of imaging the three-dimensional distribution of isotopes in the myocardium are discussed. Three-dimensional imaging was examined using multiple Anger-camera views. Longitudinal tomographic images with compensation for blurring were studied. Transverse-section reconstruction using coincidence detection of annihilation gammas from positron emitting isotopes was investigated. Author

N77-16714* Veterans Administration Hospital, Denver, Colo. Dept. of Medicine and Nuclear Medicine Service.

**DYNAMIC RADIONUCLIDE DETERMINATION OF REGIONAL LEFT VENTRICULAR WALL MOTION USING A NEW DIGITAL IMAGING DEVICE**

Peter Steele and Dennis Kirch *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 273-276 refs

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In 47 men with arteriographically defined coronary artery disease comparative studies of left ventricular ejection fraction and segmental wall motion were made with radionuclide data obtained from the image intensifer camera computer system and with contrast cineventriculography. The radionuclide data was digitized and the images corresponding to left ventricular end-diastole and end-systole were identified from the left ventricular time-activity curve. The left ventricular end-diastolic and end-systolic images were subtracted to form a silhouette difference image which described wall motion of the anterior and inferior left ventricular segments. The image intensifier camera allows manipulation of dynamically acquired radionuclide data because of the high count rate and consequently improved resolution of the left ventricular image. Author

N77-16715* Washington Univ., St. Louis, Mo. Dept. of Medicine.

**POSITRON EMISSION RECONSTRUCTION TOMOGRAPHY FOR THE ASSESSMENT OF REGIONAL MYOCARDIAL METABOLISM BY THE ADMINISTRATION OF SUBSTRATES LABELED WITH CYCLOTRON PRODUCED RADIONUCLIDES**

Michel M. Ter-Pogossian, Edward J. Hoffman, Edward S. Weiss, R. Edward Coleman, Michael E. Phelps, Michael J. Welch, and Burton E. Sobel *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 277-283 refs Sponsored by NIH

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A positron emission transverse tomograph device was developed which provides transaxial sectional images of the distribution of positron-emitting radionuclides in the heart. The images provide a quantitative three-dimensional map of the distribution of activity unencumbered by the superimposition of activity originating from regions overlying and underlying the plane of interest. PETT is used primarily with the cyclotron-produced radionuclides oxygen-15, nitrogen-13 and carbon-11. Because of the participation of these atoms in metabolism, they can be used to label metabolic substrates and intermediary molecules incorporated in myocardial metabolism. Author

N77-16716* Texas Univ., Dallas. Southwestern Medical School.

**THE ROLE OF TECHNETIUM-99m STANNOUS PYROPHOSPHATE IN MYOCARDIAL IMAGING TO RECOGNIZE, LOCALIZE AND IDENTIFY EXTENSION OF ACUTE MYOCARDIAL INFARCTION IN PATIENTS**

James T. Willerson, Robert W. Parkey, Frederick J. Bonte, Ernest M. Stokely, and E. Maximilian Buja *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 285-291 refs Sponsored by NIH

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The ability of technetium-99m stannous pyrophosphate myocardial scintigrams to aid diagnostically in recognizing, localizing, and identifying extension of acute myocardial infarction in patients was evaluated. The present study is an extension of previous animal and patient evaluations that were recently

performed utilizing this myocardial imaging agent. Author

**N77-16717*** California Univ., San Diego. Div. of Nuclear Medicine and Cardiology.
**ASSESSMENT OF LEFT VENTRICULAR EJECTION FRACTION BY RADIONUCLIDE ANGIOGRAPHY. COMPARISON TO ECHOCARDIOGRAPHY AND SERIAL MEASUREMENTS IN PATIENTS WITH MYOCARDIAL INFARCTION**
Heinrich R. Schelbert, Hartmutt Henning, Robert A. ORourke, and William L. Ashburn. *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 293-297 refs

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Measurements of the left ventricular ejection fraction were compared in patients with previous myocardial infarctions. Left ventricular ejection fraction was measured by the radioisotopic method serially in patients early after an acute myocardial infarction and during the convalescence period. Ultrasound recordings were obtained utilizing a commercially available ultrasonoscope and a 1/9 cm transducer focused at 10 cm with a repetition rate of 1000 impulses per second. All recordings were made on a visicorder oscillography. Author

**N77-16718*** Stanford Univ., Calif. Cardiology Div.
**THE STANFORD-AMES PORTABLE ECHOCARDIOSCOPE: A CASE STUDY IN TECHNOLOGY TRANSFER**
Gene Schmidt and Harry A. Miller. *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 263-271 refs

(Grant NGR-05-020-634)

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A battery powered echocardioscope is described which was clinically validated on both normal subjects and patients. Its single hand held transducer provides a one dimensional image of the moving cardiac anatomy in real time. Its major advantages over existing ultrasonoscopes are its simplicity, portability, dc operation, and potentially lower production costs. Its versatility and diagnostic value were demonstrated by experienced echocardiographers. Author

**N77-16719*** Stanford Univ., Calif. Graduate School of Business.
**COMMERCIALIZING THE ECHOCARDIOSCOPE: A CASE STUDY IN BIOMEDICAL TECHNOLOGY TRANSFER**
Alain C. Enthoven. *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1975 p 313-319 refs

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The echocardioscope does not meet reasonable criteria for a profitable investment opportunity for most companies. While a demand for the product is a necessary condition for profitability, it is not sufficient. There has to be something at work on the supply side, some significant patent, or an opportunity to achieve a cost advantage based on volume, or something to prevent other companies from being able to produce the same product at the same or a lower cost. Author

**N77-16720*** Hewlett-Packard Co., Waltham, Mass.
**BIOMEDICAL TECHNOLOGY TRANSFER: A MANUFACTURER'S VIEWPOINT**
Dean O. Morton. *In* Soc. of Photo-Opt. Instrumentation Engrs. Cardiovascular Imaging and Image Processing 1976 p 321-324

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Transfer of technology from non-commercial institutions to industry has played an important role in the development of medical electronics. It is a difficult process, but if the ideas are sound, if clear medical benefits exist and if there is good fit with business plans and the strengths and goals of both parties are complementary, it can work well. In the evaluation process it is considered whether the device meets general tests for suitability for the company, whether there are opportunities for proprietary or patent protection, and whether the medical benefits are self evident or the acceptance period is apt to be long. Author

**N77-16723** Illinois Univ., Chicago.
**A THREE DIMENSIONAL LARGE DISPLACEMENT TRANSIENT ANALYSIS OF THE HUMAN SPINE AND TORSO Ph.D. Thesis**
Leonard Ernest Schwer 1976 169 p
Avail: Univ. Microfilms Order No. 77-284

A three dimensional discrete model of the human spine, torso, and head is developed for the purpose of evaluating mechanical response in pilot ejection. The model is a system of rigid bodies, which represent skeletal segments such as vertebrae, pelvis, head, and ribs, interconnected by deformable elements which represent ligaments, cartilageneous joints, viscera, and connective tissues. The basic model is modular in format, so that components may be omitted or replaced by simplified representations. Other aspects of the ejection environment such as harnesses and seat geometry are also included. Results are presented for a variety of conditions, such as different rates of onset, ejection at angles, effects of lumbar curvature, and eccentric head loadings. A method for estimating potential injury in the spinal column is developed and results for two initial configurations are presented. Dissert. Abstr

**N77-16724** Toledo Univ., Ohio.
**ANTAGONIST EMG TEMPORAL PATTERNS DURING RAPID VOLUNTARY MOVEMENT Ph.D. Thesis**
Michael B. Jacobs 1976 98 p
Avail: Univ. Microfilms Order No. 77-368

Possible antagonist controlling mechanisms during rapid voluntary movement were studied. Antagonist electromyographic temporal patterns were observed during the agonist's silent period to determine if antagonist activity during the rapid move was preprogrammed or controlled refexively. The women attempted to match a velocity controlled dot displayed on an oscilloscope screen with elbow flexion and extension. There were two types of moves: an unintentional stop of 100 degrees and an intentional stop of 90 degrees under three conditions. The average rapid move velocity was about 270 degrees per second. Additionally, the subjects performed the same tasks during moderate (about 200 degrees/second) and slow (about 150 degrees/second) velocities. Dissert. Abstr

**N77-16725** Washington Univ., Seattle.
**BIOFEEDBACK AND SKIN TEMPERATURE CONTROL: A CONTROLLED STUDY Ph.D. Thesis**
Barry Alan Alberstein 1976 120 p
Avail: Univ. Microfilms Order No. 77-548

Male, volunteer, undergraduates (56) were randomly assigned to one of four treatment conditions: visual, finger skin temperature feedback and instructions to increase digital temperature; feedback and instructions to decrease temperature; no feedback, but instructions to relax; and visual frontalis muscle EMG feedback and instructions to relax the forehead. All subjects were monitored on both frontalis EMG and digital skin temperature. All were given one 30 min baseline session and four training sessions consisting of a 10 min wait, 15 mins of baseline, and 15 mins of feedback. The findings offer strong support for the learning of EMG and vasoconstriction control, but do not support the learning of digital vasodilation with biofeedback. Dissert. Abstr

**N77-16726#** Civil Aeromedical Inst., Oklahoma City, Okla.
**AVIATION MEDICINE TRANSLATIONS: ANNOTATED BIBLIOGRAPHY OF RECENTLY TRANSLATED MATERIAL, 9**
Gregory N. Constant, E. Jean Grimm, D. R. Goulden, and Lanelle E. Murcko Apr. 1976 10 p
(AD-A031492/2; FAA-AM-76-4) Avail: NTIS HC A02/MF A01 CSCL 06/5

An annotated bibliography of translations of foreign-language articles is presented. The 20 listed entries are concerned with studies of cardiology; aviation vestibular testing and vestibular factors in accidents; use of bones in identification of remains; psychological characteristics associated with pilots, stewardesses, and nuclear workers; stresses of flying; and performance effects of time-zone crossings as well as studies of hypoxia, visual illusions, lighting of instrument dials, noise effects, toxicology, physiological effects of infrasonic stimulation, and expert testimony

in aircraft accident investigation. Procedures for obtaining copies of the translations are included. Author

N77-16727*# Naval Aerospace Medical Research Lab., Pensacola, Fla.
**ATLAS OF NUCLEAR EMULSION MICROGRAPHS FROM PERSONNEL DOSIMETERS OF MANNED SPACE MISSIONS**
Hermann J. Schaefer and Jeremiah J. Sullivan 27 May 1976 53 p refs
(NASA Order T-3057-C)
(NASA-CR-149446; AD-A025970; NAMRL-Mono-22) Avail: NTIS HC A04/MF A01 CSCL 06/18

A collection of micrographs is presented taken from nuclear emulsions of personnel dosimeter packs carried by the astronauts on near-earth orbital and lunar missions. It is intended as a pictorial record and illustration of the radiation environment in space and as a supplement to earlier reports and publications of the laboratory in which the emulsion findings have been presented in detail for individual missions. A complete list of those earlier accounts precedes the picture sections.
Author (GRA)

N77-16728# Advisory Group for Aerospace Research and Development, Paris (France).
**BIOPHYSICAL PROBLEMS IN AEROSPACE MEDICINE**
Dec 1976 167 p In ENGLISH and FRENCH
(AGARD-AR-84; ISBN-92-835-0168-3) Avail: NTIS HC A08/MF A01

Present knowledge in the field of extraterrestrial radiation is reviewed and the exposure of flying personnel to cosmic radiation is examined. The use of lasers and radars in military aviation is discussed. Emphasis is placed on the flight safety and protection of flying and ground personnel and on the primary concern of medical officers in the various armed forces. Information is given on the positive aspects of some of the research undertaken.

N77-16729# Atomic Weapons Research Establishment, Aldermaston (England).
**COSMIC RADIATION DOSES AT AIRCRAFT ALTITUDES**
E. W. Fuller *In* AGARD Biophysical Probl. in Aerospace Dec. 1976 p 3-26 refs

Avail: NTIS HC A08/MF A01

The radiological doses associated with cosmic radiation in the altitude bands used by military aircraft are examined. Three altitude bands were studied: 35,000 to 40,000 ft. (200g/sq cm) used by subsonic jets, 50,000-55,000 ft (100g/sq cm) for supersonic aircraft operating at about Mach 2 and 38,000 ft. (20g/sq cm) for aircraft operating at Mach 3. It was seen that the greater part of the dose arises from lightly ionizing radiation and from neutrons of energy up to a few MeV. For these radiations the procedures for converting the data from flux measurements to dose estimates are well established in principle. Author

N77-16730# Hopital Begin, St. Mande (France).
**BIOLOGICAL STUDIES OF COSMIC RADIATION**
R. P. Delahaye and A. Pfister *In* AGARD Biophysical Probl. in Aerospace Dec. 1976 p 27-36 refs

Avail: NTIS HC A08/MF A01

Various types of experiments pertinent to the biological effects of cosmic radiation are discussed. It is concluded that cosmic rays may be hazardous to personnel of space flight of long duration. L.S.

N77-16731# Hopital Begin, St. Mande (France).
**RADIOBIOLOGICAL PROBLEMS OF HIGH ALTITUDE FLIGHTS (BELOW 25 km)**
R. P. Delahaye and D. Sturrock *In* AGARD Biophysical Probl. in Aerospace Dec. 1976 p 37-44 refs

Avail: NTIS HC A08/MF A01

Various forms of irradiation are studied; small doses of galactic cosmic radiation, large doses from solar flares, and exposure to heavy ions. Risk due to radiocarcinogenesis and the deduction of life span due to ionizing radiation are examined. L.S.

N77-16732# Navy Dept., Washington, D.C.
**NON IONISING ELECTROMAGNETIC FIELDS: ENVIRONMENTAL FACTORS IN RELATION TO MILITARY PERSONNEL**
B. Servantie and P. E. Tyler *In* AGARD Biophysical Probl. in Aerospace Dec. 1976 p 45-74 refs

Avail: NTIS HC A08/MF A01

The electromagnetic radiation of radar is discussed with emphasis on its potiential hazards to living systems. L.S.

N77-16733# Sanitaetsamt der Bundeswehr, Platanenweg (West Germany).
**MEDICAL ASPECTS OF LASERS AND LASER SAFETY PROBLEMS**
W. Schwarzer *In* AGARD Biophysical Probl. in Aerospace Dec. 1976 p 75-89 refs

Avail: NTIS HC A08/MF A01

Laser technology is explained. The benefits and hazards from a biological perspective are discussed. L.S.

N77-16734 California School of Professional Psychology, Fresno
**THE EFFECTS OF VARYING NOISE AND TASK COMPLEXITY ON PERFORMANCE Ph.D. Thesis**
Russell Howard Adelson 1976 122 p
Avail: Univ. Microfilms Order No. 76-29890

For each of the task complexity conditions subjects were randomly assigned to one of three noise conditions; no noise, 80db white noise, and 80 db spoken voice. Under the conditions investigated, noise had a relatively weak effect on performance, with performance as measured by a decrease in false recognitions, improving as noise variability increases. The correct recognition rate was also significantly improved. Within the simple task the effects of noise complexity indicate a strong relationship between noise complexity and performance. There was a very strong relationship evidenced between task complexity and performance with both correct recognition and false recognition rates improving as task complexity increased. In addition there was a weak but significant interactional effect between noise variability and task complexity. The correct response rate was not affected, but the false alarm rate did decrease significantly in relation to the interaction of the two sources of stress. Dissert. Abstr.

N77-16735*# Little (Arthur D.), Inc., Cambridge, Mass.
**THERMAL CONDUCTANCE OF SPACE SUIT INSULATIONS, THERMAL MICROMETEROID GARMENTS, AND OTHER INSULATIONS Final Report**
David L. Richardson and Janet M. Stevens Dec. 1976 50 p refs
(Contract NAS9-11238)
(NASA-CR-151165) Avail: NTIS HC A03/MF A01 CSCL 06Q

The thermal protection capabilities of development and operational thermal micrometeroid garments and other insulations were evaluated. The relationship among sample thermal conductance, surface temperature, and compressive loads was empirically defined. Author

N77-16736*# Rochester Univ., N.Y. Center for Visual Science.
**STATISTICAL EVALUATION OF CONTROL INPUTS AND EYE MOVEMENTS IN THE USE OF INSTRUMENTS CLUSTERS DURING AIRCRAFT LANDING Final Report**
A. O. Dick, John Lott Brown, and George Bailey [1977] 85 p refs
(Grant NsG-1211)
(NASA-CR-149465; TR-4-76) Avail: NTIS HC A05/MF A01 CSCL 05H

Two different types of analyses were done on data from a study in which eye movements and other variables were recorded while four pilots executed landing sequences in a Boeing 737 simulation. Various conditions were manupulated, including changes in turbulence, starting position, and instrumentation.

Control inputs were analyzed in the context of the various conditions and compared against ratings of workload obtained using the Cooper-Harper scale. A number of eye-scanning measures including mean dwell time and transition from one instrument to another were entered into a principal components factor analysis. The results show a differentiation between control inputs and eye-scanning behavior. This shows the need for improved definition of workload and experiments to uncover the important differences among control inputs, eye-scanning and cognitive processes of the pilot. Author

N77-16737# Civil Aeromedical Inst., Oklahoma City, Okla.
**VISUAL EVALUATION OF SMOKE-PROTECTIVE DEVICES**
John A. Vaughan and Kenneth W. Welsh May 1976 7 p
(AD-A031493/0; FAA-AM-76-5) Avail: NTIS
HC A02/MF A01 CSCL 06/17

The visual characteristics of smoke-protective devices for flight deck crews were determined. Visual measurements were made on five male subjects, who ranged in age from 35 to 54, while they were wearing each of the 26 devices tested. These measurements included (1) visual field, (2) visual acuity, (3) stereoscopic depth perception, (4) color vision, and (5) bifocal displacement. Reduction in the temporal and inferior fields was found with some of the goggles-mask combinations. The data indicate that 30.8 percent of the test items degraded visual acuity below 20/20 at the 0.4-m distance, 15.4 percent at 0.76 m, and 7.6 percent at 6.0 m. Mean values of depth perception ranged from 2.4 percent to 404.4 percent over control. The three tinted goggles created no alterations in color perception. Bifocals worn with the oxygen mask were displaced upward; those worn with the one-piece test items were displaced downward. Criteria for an acceptable smoke-protective device are discussed. Author

N77-16738# Civil Aeromedical Inst., Oklahoma City, Okla.
**EDUCATION AS A FACTOR IN THE SELECTION OF AIR TRAFFIC CONTROLLER TRAINEES**
Bart B. Cobb, Carol L. Young, and Barbara L. Rizzuti Jun. 1976 36 p refs
(AD-A031880/8; FAA-AM-76-6) Avail: NTIS
HC A03/MF A01 CSCL 05/9

A longitudinal study of 2,352 air traffic control specialist recruits (1,858 En Route and 494 Terminal) who entered the FAA Academy basic training phase in 1969 was conducted to examine the validity of educational level, recency of education, and major areas of college study for the prediction of success in air traffic control (ATC) training. All educational variables, both before and after consideration of age effects and pre-FAA experience, were found to be negligibly and/or inversely related to ATC success. All types of aviation-related experience except ATC were found to be unreliable for prediction of training outcomes. Other findings clearly illustrated that candidacy for ATCS training should be restricted to aptitude-screened applicants no older than 30 and that a case can be made for discontinuing the awarding of credit points toward eligibility for all types of preentry experience except air traffic control. Author

N77-16739# National Aerospace Lab., Amsterdam (Netherlands). Space Flight Div.
**EFFORT INVOLVED IN SINGLE AND TWO-AXIS MANUAL CONTROL SYSTEMS**
P. H. Wewerinke 13 Nov. 1974 98 p refs
(NLR-TR-75060-U) Avail: NTIS HC A05/MF A01

A theoretical and experimental program was conducted to study human response characteristics in a variety of single and dual-axis control situations. The object was to build and support a human control effort model. The aspect of human controller's effort is indispensable for a complete description and prediction of human operator behavior and its impact on mission success. The model is formulated in the framework of optimal control theory. The control effort model results are compared with subjective ratings reflecting the effort exerted in performing a variety of single-axis and dual-axis tracking tasks. Eight single-axis control configurations were examined in order to include a wide range of human response characteristics and task difficulty. Four single-axis tasks were combined, yielding four dual-axis configurations to extend the control effort model to multivariable control situations. Especially the latter part of the program is exploratory. The excellent agreement between computed and rated control effort is very encouraging, although the multivariable control effort model needs further development and validation by means of more experimental data. Author (ESA)

N77-16740# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
**A COMPARISON OF THE PERCEIVED INTENSITY OF SINUSOIDAL AND MULTIFREQUENCY WHOLE-BODY VIBRATION**
Richard W. Shoenberger Jun. 1976 14 p refs
(AF Proj. 7231)
(AD-A029203; AMRL-TR-76-1) Avail: NTIS
HC A02/MF A01 CSCL 05/5

Existing standards for human exposure to whole-body vibration are based heavily on data from experiments in which the vibration inputs were single sinusoids. An intensity matching technique was used to test the independent component method for evaluating complex vibration environments composed of multiple sine waves. Ten subjects adjusted the intensity of a 25 Hz sinusoid to match the subjective intensity of 11, 17, 40, and 63 Hz sinusoids (all with intensities at the same criterion level), presented either singly or in all possible combinations of two, three or four frequencies. The results showed a monotonic relationship between perceived intensity and the number of sinusoids in the stimulus (i.e., the acceleration of the matching response increased significantly as the number of sinusoids increased). These findings indicate (at least for the frequency range sampled) that the 'independent frequency' method of evaluating non-sinusoidal vibrations will underestimate the severity of such complex vibration environments. GRA

N77-16741# System Development Corp., Santa Monica, Calif.
**SURVEY OF COMPUTER SOFTWARE FOR THE HUMAN ENGINEERING SYSTEMS SIMULATION FACILITY Final Report, Jun. 1969 - Dec. 1970**
George R. Meyer Jul. 1976 159 p refs
(Contract F33615-69-C-1868; AF Proj. 7184)
(AD-A028301; SDC-FN-DA-(L)-143/115/00; AMRL-TR-71-61)
Avail: NTIS HC A08/MF A01 CSCL 09/2

An investigation of digital computer programs and simulation techniques for the Human Engineering Systems Simulation (HESS) facility is described. The survey is directly related to the unique equipment configuration of the HESS facility and is intended to contribute to the Aerospace Medical Research Laboratory's responsibility to quantitatively define human performance in a systems context. The study included visits to organizations containing relevant computer programs and transfer of select programs to the HESS computer. An informal bibliography of material collected and reviewed during the survey is included. GRA

N77-16742# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
**A PROGRESS REPORT ON VISIONS: REPRESENTATION AND CONTROL IN THE CONSTRUCTION OF VISUAL MODELS Interim Report**
Allen R. Hanson and Edward M. Riseman Jul. 1976 59 p refs
(Contract N00014-75-C-0459; Grant NSF DCR-75-16098)
(AD-A028329; COINS-TR-76-9) Avail: NTIS
HC A04/MF A01 CSCL 09/2

This report is an interim progress report on the evolving structure of VISIONS, a computer system for general visual perception. The goal of the system is the segmentation and interpretation of a digitized color image of natural outdoor scenes. The report outlines the multi-level data structures used for representing both a visual model of the scene and the semantic data base of stored knowledge about the world. A flexible modular strategy controls the operation of processes which embody diverse forms of knowledge, and allows both data-directed and knowledge-directed model building. A model search space is used to store

a sketch of the processing history during model formation, so that limited, directed back-tracking will be facilitated. GRA

N77-16743# Navy Experimental Diving Unit, Panama City, Fla.
**FIRST ARTICLE ACCEPTANCE PORTABLE RECOMPRESSION SYSTEM DIXIE MANUFACTURING COMPANY Final Report, 1 Nov. 1975 - 21 Jan. 1976**
J. N. Mares, R. H. Fine, and D. B. Hartman 1976 17 p refs (AD-A028354; NEDU-3-76) Avail: NTIS HC A02/MF A01 CSCL 13/1

The one man portable recompression system covered in this report is the first article developed for the U.S. Navy by Dixie Manufacturing Company. A prototype of this unit built by Battelle Memorial Institute was previously tested at the Navy Experimental Diving Unit and the results promulgated in NAVXDIVINGU Report 1-74 of 16 January 1974. It is not the intent of this test to repeat all aspects of that technical evaluation but to provide test criteria for first article acceptance. This unit (PRS) is intended as an emergency means of transporting an injured diver to a treatment facility while under pressure and provide immediate relief from illness during transportation. The (PRS) can be used under medical supervision to administer the treatment schedules of tables 1A, 2A, 3 and 4 of the U.S. Navy Diving Manual. Author (GRA)

N77-17676*# Food and Drug Administration, Cincinnati, Ohio. Div. of Microbiology.
**ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Jul. - 30 Sep. 1976**
A. L. Reyes, J. E. Campbell, A. J. Wehby, R. G. Crawford, J. C. Wimsatt, and J. T. Peeler Dec. 1976 9 p
(NASA Order W-13411)
(NASA-CR-149658; QPR-46) Avail: NTIS HC A02/MF A01 CSCL 06M

Experiments performed on the heat resistant organism CK 4-6 are described. Its response to dry heat at two temperatures (125 C and 135 C) at eight humidity levels (< 0.001 percent to 100 percent RH) in a closed can system is studied. Author

N77-17677*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
**BIOPROCESSING IN SPACE**
Dennis R. Morrison, comp. Jan. 1977 217 p refs Conf. held at Houston, Tex., 10-12 Mar. 1976
(NASA-TM-X-58191; JSC-11582) Avail: NTIS HC A10/MF A01 CSCL 06B

Proceedings are presented of the 1976 NASA Colloquium on bioprocessing in space. The program included general sessions and formal presentations on the following topics: NASA's Space Shuttle, Spacelab, and space-processing programs; the known unusual behavior of materials in space; space-processing experiment results; cell biology, gravity sensors in cells, space electrophoresis of living cells, new approaches to biosynthesis of biologicals from cell culture in space, and zero-g fermentation concepts; and upcoming flight opportunities and industrial application planning studies already underway.

N77-17683*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
**SURVEY OF CELL BIOLOGY EXPERIMENTS IN REDUCED GRAVITY**
Gerald R. Taylor *In its* Bioprocessing in Space Jan. 1977 p 77-102 refs
Avail: NTIS HC A10/MF A01 CSCL 06B

The effects of spaceflight on terrestrial cell systems are discussed. With some important exceptions, static cell systems carried aboard U.S.A. and U.S.S.R. space flights have failed to reveal space related anomalies. Some sophisticated devices which were developed for viewing directly, or continuously recording, the growth of cells, tissue cultures and eggs in flight, are described and the results summarized. The unique presence of high energy, multicharged (HZE) particles and full-range ultraviolet irradiation in space prompted evaluation of the response of single cells to these factors. Summary results and general conclusions are presented. Potential areas of research in future space flights are identified. Author

N77-17684*# Pennsylvania State Univ., University Park.
**GRAVITY AND THE CELL: INTRACELLULAR STRUCTURES AND STOKES SEDIMENTATION**
Paul Todd *In* NASA. Lyndon B. Johnson Space Center Bioprocessing in Space Jan. 1977 p 103-116 refs

(Contract AT(30-1)-3834)
Avail: NTIS HC A10/MF A01 CSCL 06B

Plant and certain animal embryos appear to be responsive to the gravity vector during early stages of development. The convection of particle sedimentation as the basis for the sensing of gravity is investigated using the cells of wheat seedlings, amphibian embryos, and mammals. Exploration of the mammalian cell for sedimenting particles reveals that their existence is unlikely, especially in the presence of a network of microtubules and microfilaments considered to be responsible for intracellular organization. Destruction of these structures renders the cell susceptible to accelerations several times g. Large dense particles, such as chromosomes, nucleoli, and cytoplasmic organelles are acted upon by forces much larger than that due to gravity, and their positions in the cell appear to be insensitive to gravity. Author

N77-17685*# Veterans Administration, Washington, D.C.
**BIOPROCESSING: PROSPECTS FOR SPACE ELECTROPHORESIS**
Milan Bier *In* NASA. Lyndon B. Johnson Space Center Bioprocessing in Space Jan. 1977 p 117-124 refs

(Contract NAS8-29566)
Avail: NTIS HC A01/MF A01 CSCL 06B

The basic principles of electrophoresis are reviewed in light of its past contributions to biology and medicine. The near-zero gravity environment of orbiting spacecraft may present some unique advantages for a variety of processes, by abolishing the major source of convection in fluids. As the ground-based development of electrophoresis was heavily influenced by the need to circumvent the effects of gravity, this process should be a prime candidate for space operation. Nevertheless, while a space facility for electrophoresis may overcome the limitations imposed by gravity, it will not necessarily overcome all problems inherent in electrophoresis. These are, mainly, electroosmosis and the dissipation of the heat generated by the electric field. The NASA program has already led to excellent coatings to prevent electroosmosis, while the need for heat dissipation will continue to impose limits on the actual size of equipment. It is also not excluded that, once the dominant force of gravity is eliminated, disturbances in fluid stability may originate from weaker forces, such as surface tension. Author

N77-17686*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**ELECTROPHORETIC SEPARATION OF HUMAN KIDNEY CELLS AT ZERO GRAVITY**
Grant H. Barlow (Abbott Labs., North Chicago, Ill.), S. LaVera Lazer (Abbott Labs., North Chicago, Ill.), Annemarie Rueter (Abbott Labs., North Chicago, Ill.), and Robert Allen *In its* Bioprocessing in Space Jan. 1977 p 125-142 refs

(Contract NAS8-30591)
Avail: NTIS HC A10/MF A01 CSCL 06B

Electrophoretic isolation of cells results in a loss of resolution power caused by the sedimentation of the cells in the media.

The results of an experiment to extract urokinase from human embryos during the Apollo Soyuz mission are presented and discussed. A.H.

**N77-17687*#** General Electric Co., Philadelphia, Pa. Space Sciences Lab.
**ELECTROPHORESIS FOR BIOLOGICAL PRODUCTION**
Louis R. McCreight *In* NASA. Lyndon B. Johnson Space Center Bioprocessing in Space Jan. 1977 p 143-158

Avail: NTIS HC A01/MF A01 CSCL 06B

Preparative electrophoresis may provide a unique method for meeting ever more stringent purity requirements. Prolonged near zero gravity in space may permit the operation of preparative electrophoresis equipment with 100 times greater throughput than is currently available. Some experiments with influenza Virus Antigen, Erythropoietin and Antihemophaliac Factor, along with process and economic projections, are briefly reviewed. Author

**N77-17688*#** Fermentation Design, Inc., Bethlehem, Pa.
**SOME QUESTIONS OF SPACE BIOENGINEERING**
Laszlo K. Nyiri *In* NASA. Lyndon B. Johnson Space Center Bioprocessing in Space Jan. 1977 p 159-180 refs

Avail: NTIS HC A10/MF A01 CSCL 06B

Zero-gravity offers selective effect on growth and metabolic activity unicellular organisms as well as unique opportunities in purification of organic compounds. These make it possible to consider the biosynthesis and recovery of certain metabolites economically feasible in space. Design, construction and operation of systems for the above mentioned purposes requires interdisciplinary actions within the scope of a new discipline: space bioengineering. The problems and perspectives of this discipline particularly in the application of bioreactor-recovery systems in space to manufacture metabolites of high economic and scientific value. Special attention is paid to pivotal factors such as various mass transport phenomena, contamination control, automatic control of optimum environment and synchronization of the operation of the biological (biosynthesis) and the physiochemical (recovery-purification) systems. Author

**N77-17689*#** Bio Innovar, Inc., Storm Lake, Iowa.
**INFLUENCE OF ZERO-G ON SINGLE-CELL SYSTEMS AND ZERO-G FERMENTER DESIGN CONCEPTS**
Jerry V. Mayeux *In* NASA. Lyndon B. Johnson Space Center Bioprocessing in Space Jan. 1977 p 181-190 refs

Avail: NTIS HC A10/MF A01 CSCL 06B

An analysis was made to identify potential gravity-sensitive mechanisms that may be present in the single-cell growth system. Natural convection (density gradients, induced sedimentation, and buoyancy) is important in microbial systems. The absence of natural convection in the space-flight environment could provide an opportunity for new approaches for developments in industrial fermentation and agriculture. Some of the potential influences of gravity (i.e., convection, sedimentation, etc.) on the cell were discussed to provide insight into what experimental areas may be pursued in future space-flight research programs. Author

**N77-17692*#** Kanner (Leo) Associates, Redwood City, Calif.
**THE EFFECT OF AMBIENT TEMPERATURE ON METABOLISM AND HEART RATE IN RESTING ALBINO RATS**
F. Bernet, M. Collache, and J. Denimal Washington NASA Feb. 1977 16 p refs Transl. into ENGLISH from Arch. Intern. de Phys. et de Biochom. (France), v. 83, 1975 p 633-645
(Contract NASw-2790)
(NASA-TT-F-17393) Avail: NTIS HC A02/MF A01 CSCL 06C

Heart rate and oxygen consumption were measured simultaneously in albino rats. These measurements were carried out in the resting animal at different temperatures between 18 and 33 C. Thermal neutrality was placed at 29 C. Results show that resting heart rate varies with metabolism. It shows the lowest values around the thermoneutrality point and increases rapidly as the environment cools. On the other hand, the non-linear relationship between metabolism and heart rate indicates that the increase in heart rate is not the only factor involved in increased oxygen consumption in the regulation of body temperature. Author

**N77-17693*#** Kanner (Leo) Associates, Redwood City, Calif.
**HYGROPHORUS (LIMACIUM) HYPOTHEJUS FR. IN MYCORRHIZAL SYNTHESIS WITH PINE (PINUS SILVESTRIS L.) IN PURE CULTURES ON AGAR**
R. Rachlewski and J. Pachlewska Washington NASA Feb. 1977 12 p refs Transl. into ENGLISH from Biul. Inst. Badawczego Lesnictwa (Warsaw), no. 5 427-432, 1974 p 205-212
(Contract NASw-2790)
(NASA-TT-F-17396) Avail: NTIS HC A02/MF A01 CSCL 06C

The biological test performed to determine the symbiotic characteristics of hygrophorus hypothejus permitted its classification among the mycorrhizal fungi of Pinus silvestris and also as an effective component in mycorrhizal associations with the pine during its juvenile stage of development. The progress of the mycorrhizal reaction with pine seedlings under conditions of synthesis in pure cultures on agar, characterized by a fast spread of the mycorrhizal infection in roots of seedlings and the formation of a large number of ectotrophic mycorrhizae, indicates a relatively high activity of H. hypothejus as a symbiont of pine seedlings. The results obtained from the mycorrhizal synthesis of pine with H. hypothejus, along with observations of this fungus in nature, suggest a high degree of symbiotic specialization of H. hypothejus for which pine is an indispensible partner. Author

**N77-17694*#** Scientific Translation Service, Santa Barbara, Calif.
**STUDY OF THE VAPOR STERILIZATION PROCESS FOR NEW FILTERING MATERIALS**
I. A. Kazakova, G. L. Motina, and V. A. Semenyuk Washington NASA Feb. 1977 11 p refs Transl. into ENGLISH from Khimiko-farmatsevticheskiy Zhurnal (USSR), v. 10, no. 10, 1976 p 103-107
(Contract NASw-2791)
(NASA-TT-F-17516) Avail: NTIS HC A02/MF A01 CSCL 06M

A study is made of a vapor sterilization process using live vapor to sterilize new filtering materials. The results give the required sterilization time for several new domestic filtering materials. Author

**N77-17695*#** Oregon State Univ., Corvallis.
**ASSESSMENT OF THE IMPACT OF INCREASED SOLAR ULTRAVIOLET RADIATION UPON MARINE ECOSYSTEMS Annual Progress Report, 8 Oct. 1975 - 8 Oct. 1976**
Henry VanDyke and Robert C. Worrest 8 Oct. 1976 40 p refs
(Contract NAS9-14860)
(NASA-CR-151201) Avail: NTIS HC A03/MF A01 CSCL 06C

Data was provided to assess the potential impact upon marine ecosystems if space shuttle operations contribute to a reduction of the stratospheric ozone layer. The potential for irreversible damage to the productivity, structure and/or functioning of a model estuarine ecosystem by increased UV-B radiation was established. The sensitivity of key community components (the primary producers) to increased UV-B radiation was delineated. Author

**N77-17696#** Institut Franco-Allemand de Recherches, St. Louis (France).
**EFFECT OF NUMBER AND RHYTHM OF SHOT NOISE (WEAPON SHOTS) ON THE HEARING OF GUINEA PIGS [INFLUENCE DU NOMBRE ET DU RYTHME D'EXPOSITIONS A DES BRUITS IMPULSIFS (BRUITS D'ARME) SUR L'APPAREIL AUDITIF DU COBAYE]**
A. Dancer, R. Franke, G. Evrard, G. Parmentier, P. Drews, and E. Burde 28 Nov. 1975 35 p refs In FRENCH
(Contract DRME-74/735)
(ISL-R-133/75) Avail: NTIS HC A03/MF A01

The effect of shots produced in the open was investigated. Audiometry, based on recording of the cochlea potentials, led

to the following results: the recovery time of auditory sensitivity is a function of 10 log t; the amplitude of the temporary threshold shift (TTS) is according to 20 log N, N being the number of shots; the amplitude of the TTS is maximum for 6 to 60 shots per minute. The validity of the existing standard curves (Coles and Pfander diagrams), as well as their applicability, are discussed. ESA

N77-17697# Bundesforschungsanstalt Fuer Fischerei, Hamburg (West Germany). Inst. fuer Seefischerei.
**BIOLOGICAL PRODUCTIVITY IN THE MEXICAN PACIFIC COASTAL WATERS Interim Report**
Siegfried Ehrich Bonn Bundesmin. fuer Forsch. u. Technol. Oct 1976 20 p refs In GERMAN; ENGLISH summary
(Contract BMFT-MF-302)
(BMFT-FB-M-76-02) Avail: NTIS HC A02/MF A01; ZLDI, Munich, DM 4.20

Investigations were made in the coastal waters of the northeast Pacific between 14 and 46 deg N from October 10, 1974, to May 25, 1975, to determine cost effectiveness of trawler operations. At the same time the hydrography, plankton, fish stocks, and benthonic fauna of the region were studied in the interests of Mexican coastal fisheries. The activities at sea, the hydrographic conditions during the expedition, and the growth of the hake (merluccius productus) are reported. Some parameters to describe the stock of hake and the first results of the investigation on the rockfish (sebastes entomelas) are given. Author (ESA)

N77-17699*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**ASPIRIN/METIAMIDE COMPOSITION Patent Application**
Patricia A. Brown, inventor (to NASA) (San Jose State Univ., Calif.) Filed 31 Jan. 1977 15 p Sponsored by NASA
(NASA-Case-ARC-11038-1; US-Patent-Appl-SN-764329) Avail: NTIS HC A02/MF A01 CSCL 06E

A pharmaceutical preparation is described which counters gastric distress caused by the ingestation of aspirin by the inclusion of metiamide in the analgesic formulation. NASA

N77-17700*# Houston Univ., Tex. Chemistry Dept.
**DEVELOPMENT OF AUTOMATED ANALYTICAL CAPABILITY FOR THE EARLY DETECTION OF DIABETES MELLITUS Final Report**
Albert Zlatkis May 1976 21 p refs
(Contract NAS9-14534)
(NASA-CR-151204) Avail: NTIS HC A02/MF A01 CSCL 06E

The total profile of volatile metabolites in urine of patients with diabetes mellitus was studied. Because of the drastic abnormalities in the metabolism of carbohydrates, lipids, and proteins connected with diabetes it was expected that apart from acetone further characteristic abnormalities occur in the profiles if volatile urinary metabolites in cases of diabetes mellitus. Quantitative and qualitative changes were found in these urines as compared to the urines of normal subjects. Author

N77-17701*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**CONTOUR DETECTOR AND DATA ACQUISITION SYSTEM FOR THE LEFT VENTRICULAR OUTLINE Patent Application**
John H. C. Reiber, inventor (to NASA) Filed 16 Feb. 197? 45 p
(NASA-Case-ARC-10985-1; US-Patent-Appl-SN-769148) Avail: NTIS HC A03/MF A01 CSCL 06B

A real-time contour detector and data acquisition system for an angiographic apparatus was stipulated. A video scanner converted an x-ray image of a structure characterized by a change in brightness level compared with its surrounding into video format and displayed the X-ray image in recurring video fields. Author

N77-17702# Oak Ridge National Lab., Tenn.
**FIFTY YEAR DOSE COMMITMENT TO VARIOUS ORGANS AND TISSUES FROM INHALATION OF Xe-133**
S. R. Bernard and W. S. Snyder 1976 16 p refs Presented at Symp. on Radiopharmaceutical Dosimetry, Oak Ridge, Tenn., 26 Apr. 1976 Sponsored by ERDA
(CONF-760444-1). Avail: NTIS HC A02/MF A01

A metabolic model for a single inhalation of Xe133, together with the computer code in use at this Laboratory, was employed for estimating dose commitments to various organs and tissues in the adult human body. The code uses Monte Carlo data for photons and assumes complete absorption of the energy from the emitted electrons in organs and tissues. For bone, a model was used to estimate dose to red and yellow marrow and to endosteal cells of both trabecular and cortical bone. For a single inhalation of 1 mCi of Xe133 the 50 year dose to gonads was about 0.4 mrad. The dose to lungs from Xe133 dissolved in tissues is about the same, but the dose to the lungs from Xe133 in air spaces was about 1 mrad. Author (ERA)

N77-17703# Food and Drug Administration, Rockville, Md. Div. of Electronic Products.
**DIAGNOSTIC ULTRASOUND: A REVIEW OF CLINICAL APPLICATIONS AND THE STATE OF THE ART OF COMMERCIAL AND EXPERIMENTAL SYSTEMS Final Technical Report**
Stephen W. Smith Aug. 1976 92 p refs
(PB-258237/7; FDA/BRH-76/124;
DHEW/PUBL/FDA-76/8055) Avail: NTIS HC A05/MF A01 CSCL 06L

An overview of the current status of diagnostic ultrasound is given. Estimates are made of the size of the commercial diagnostic ultrasound market and the extent of clinical applications of the modality. Descriptions are presented of the current training opportunities and the professional societies involved in diagnostic ultrasound. GRA

N77-17704# Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
**HIERARCHICAL INTELLIGENT CONTROL OF A PROSTHETIC ARM**
G. N. Saridis and H. E. Stephanou Jul. 1976 227 p refs
(Grants NSF GK-36607; NSF ENG-74-17586)
(PB-258049/6; TR-EE-76-21) Avail: NTIS HC A11/MF A01 CSCL 06L

A hierarchical method combining analytical techniques from control theory and heuristic techniques from artificial intelligence is presented, and applied to the decentralized control of a prosthetic arm. The dynamic model of the arm is derived, and performance criteria are suggested for the kinematic and the dynamic evaluation of the system response. The principle of minimum interaction is used to decompose the prosthetic system into seven subsystems, one per mechanical degree of freedom. A 'suboptimal' control structure for nonlinear systems is proposed in conjunction with a performance adaptive self-organizing control algorithm. Syntactic pattern classification is used for the dynamic coordination of the subsystems. The syntax of the man-machine commands is also examined. GRA

N77-17705# Office of Radiation Programs, Washington, D.C. Environmental Analysis Div.
**POTENTIAL RADIOLOGICAL IMPACT OF AIRBORNE RELEASES AND DIRECT GAMMA RADIATION TO INDIVIDUALS LIVING NEAR INACTIVE URANIUM MILL TAILINGS PILES**
Jerry J. Swift, James M. Hardin, and Harry W. Calley Jan. 1976 53 p refs
(PB-258166/8; EPA-520/1-76-001) Avail: NTIS HC A04/MF A01 CSCL 06R

The estimated potential annual dose from radioactive radon decay products to individuals in dwellings in the vicinity of an average inactive pile is approximately 8 rem to the tracheobronchial region of the lungs at about 50 meters from the pile, 0.3 rem at 1 kilometer, and 0.1 rem at about 2.2 kilometers. The corresponding doses to the pulmonary region of the lungs from airborne uranium thorium-230, and radium-226 are estimated to be about one-third as large, within 1 kilometer of the pile. Gamma exposure rates on the tailings are up to 1 mR/hr. Estimated exposure rates are in reasonable agreement with the limited data from field measurements. GRA

N77-17706# Army Aeromedical Research Lab., Fort Rucker, Ala.
**SOME SPECIFIC EFFECTS OF HYPOBARIC HYPOXIA ON CELLULAR METABOLISM Final Report**
Dennis A. Baeyens and Mary J. Meier Jan. 1976 18 p refs
(AD-A028928; USAARL-76-11) Avail: NTIS HC A02/MF A01 CSCL 06/19

The lactate dehydrogenase (LDH) and succinate dehydrogenase (SDH) activity of mouse liver homogenates were examined after exposure to an equivalent altitude of 36,000 feet and compared to controls kept at ground level. After 6 and 12 hour incubation periods, the altitude exposed samples demonstrated a significantly higher LDH activity than controls. SDH activity remained unchanged from controls after 6 hours but was significantly lower than controls after 12 hour exposures to altitude. It is concluded that the changes in enzyme activity reflect a metabolic control mechanism to maintain adequate energy production during periods of exposure to hypobaric hypoxic stress.
Author (GRA)

N77-17707# Emmanuel Coll., Boston, Mass.
**ROLE OF NUCLEAR STARS IN THE LIGHT FLASHES OBSERVED ON SKYLAB 4 Scientific Report, 1 May 1975 - 30 Apr. 1976**
Peter J. McNulty, Robert C. Filz, and Paul L. Rothwell Hanscom AFB, Mass. AFGL May 1976 18 p refs
(Contract F19628-73-C-0190; AF Proj. 8600)
(AD-A028733; AFGL-TR-76-0151; SR-3) Avail: NTIS HC A02/MF A01 CSCL 06/18

The astronauts on Skylab 4 observed bursts of intense visual light-flash activity when their spacecraft passed through the portion of the earth's inner trapped radiation belt known as the South Atlantic Anomaly (SAA). Two experimental sessions were carried out on board Skylab which compare the flash rates with the measured flux of Z greater than or equal to 1 particles that would pass through the astronaut's eyes. It was concluded that the flash rates, which became as great as 20/minute, were anomalously high. The authors explored a number of alternative explanations for the anomalous flash rates that would be consistent with the accepted SAA flux values and the laboratory data on particle induced visual sensations and found that when one includes the effect of nuclear interactions in and near the retina which result in star formation (the emission of slow protons, neutrons, and alphas from the nucleus in an evaporation-like process) the apparent anomaly is removed.
GRA

N77-17708# Edgewood Arsenal, Aberdeen Proving Ground, Md.
**ADDED AIRWAY RESISTANCE AND ENDURANCE IN INTENSIVE EXERCISE Technical Report, Aug. - Dec. 1974**
Fred W. Stemler and Francis N. Craig Jul. 1976 31 p refs
(DA Proj. 1W7-62710-AD-2501)
(AD-A028290; EB-TR-76040) Avail: NTIS HC A03/MF A01 CSCL 06/19

The effect of added airway resistance on endurance in running on a treadmill at 7 mph was tested in US Army male volunteers. Various combinations of inspiratory and expiratory resistance were provided by the following respiratory conditions: (A) standard M17A1 protective mask, (B) modified M17 mask, (C) peripheral M9 mask, (D) M9 mask less filter, (E) mouthpiece and nose-clip, and (F) bareheaded control. In a pilot study, conditions (A) and (F) were compared at two grades on the treadmill. The decrement in endurance due to condition (A) was greater at the lower grade. In series 1 and 2, the six conditions were compared at a single grade for each of nine men, including duplicate tests on three of the men. The results were consistent with the hypothesis that the decrement in endurance due to added airway resistance will be small at high and low work rates and will be maximal at some intermediate work rate. The small added airway resistance commonly found in equipment for making various respiratory measurements during exercise can cause a decrement in endurance in proportion to the size of the resistance. The results raised the question of whether, in the range of resistances of modern protective masks, the expiratory resistance is more critical than the inspiratory.
GRA

N77-17709# DARCOM Intern Training Center, Texarkana, Tex.
**PERFORMANCE OF A MAINTENANCE TASK IN A HIGH TEMPERATURE ENVIRONMENT Final Report**
Terry Lee Durren Jun. 1976 43 p refs
(AD-A028798; DARCOM-ITC-02-08-76-024) Avail: NTIS HC A03/MF A01 CSCL 06/19

The purpose of the research is to determine the effect that temperature has on the ability of an individual to perform a maintenance task. To demonstrate the effect of temperature, a statistical comparison of the mean task completion times of two treatment levels were examined.
GRA

N77-17710# Advisory Group for Aerospace Research and Development, Paris (France).
**RECENT EXPERIMENT, ADVANCES IN AVIATION PATHOLOGY**
Dec. 1976 148 p refs Presented at the Aerospace Med. Panel Specialists' Meeting, Copenhagen, 5-9 Apr. 1976
(AGARD-CP-190; ISBN-92-835-0184-5) Avail: NTIS HC A07/MF A01

Application of the methods and techniques of pathology to the investigation of aircraft accidents and aeromedical problems are discussed. Problems concerning local, national, and international law in determining jurisdiction and other (medicolegal) questions are cited along with special methods that aviation pathologist employ to aid in evaluation of the postmortem findings. These methods include developments in toxicologic examination of tissues, roentgenographic evaluation analysis of specific injuries, and injury patterns and psychological factors were studied.

N77-17711# Armed Forces Inst. of Pathology, Washington, D.C.
**DEVELOPMENT OF AIRCRAFT ACCIDENT INVESTIGATION PROGRAM AT THE ARMED FORCES INSTITUTE OF PATHOLOGY**
William R. Cowan *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 3 p

Avail: NTIS HC A07/MF A01

The evolution of aircraft accident investigations in civilian and military aviation is presented. Three main principles governing medical support of fatal accidents: (1) environmental factors, (2) traumatic factors, (3) pre-existing disease processes are cited. Application of the tools of the forensic pathologist to the problem was initiated. Environmental factors such as carbon monoxide, and fuels were given top priority along with development of a procedure for lactic acid to detect hypoxia. Screening procedures for alcohol and drugs were also developed, along with procedures conducted on each specimen for carbon monoxide, ethyl alcohol, lactic acid and acid basic neutral drugs which may have altered the flight performance of an individual.
B.B.

N77-17712# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
**DEVELOPMENT OF AVIATION ACCIDENT PATHOLOGY IN THE FEDERAL REPUBLIC OF GERMANY**
S. Krefft *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 5 p refs

Avail: NTIS HC A07/MF A01

Responsibilities and problems of aviation accident pathology are mentioned, and the importance of aviation accident pathology for the prevention of aircraft accidents and flying safety is discussed. Historical development of aviation accident pathology in Germany is presented in detail.
B.B.

N77-17713# Centre de Recherches de Medecine Aeronautique, Paris (France).
**THE PLACE AND ROLE OF MEDICAL SERVICES IN FLIGHT SAFETY STUDY OF THE ORGANIZATION AND MEANS USED IN THE FRENCH AIR FORCES [PLACE ET ROLE DES SERVICES MEDICAUX DANS LA SECURITE DES VOLS ETUDE SUR L'ORGANISATION ET LES MOYENS MIS EN OEUVRE DANS LES FORCES AERIENNES FRANCAISES]**

P. M. Pingannaud *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 6 p In FRENCH

Avail: NTIS HC A07/MF A01

The importance of the human factor in the causes of accidents or air incidents is discussed along with the necessity for doctors to actively participate in flight safety. Organizational structure and regulatory disposition effective since 1975 are studied, and the functions of the medical profession in the investigation of the causes of accidents or air incidents are defined.

Transl. by B.B.

N77-17714# Royal Air Force, Halton (England). Div. of Aerospace Pathology.

**AIRCRAFT-ACCIDENT AUTOPSIES: THE MEDICOLEGAL BACKGROUND**

John L. Christie *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 13 p refs

Avail: NTIS HC A07/MF A01

Problems encountered by the aviation pathologist seeking to perform autopsies on the victims of aircraft accidents are evaluated. Authorities having jurisdiction in special cases to conduct investigations are mentioned along with the various interests of each group for conducting their investigation. B.B.

N77-17715# Italian Air Force Medical Service H. Q., Rome.

**MEDICO-LEGAL PROBLEMS OF FLIGHT ACCIDENTS INVESTIGATION**

Gaetano Rotondo *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 14 p refs

Avail: NTIS HC A07/MF A01

Necessity is premised of close collaboration between the specialist in forensic medicine and the flight surgeon, in flying accidents investigation. These accidents are surveyed in their different types, various traumatic mechanisms and possible correlations existing between physio-psychical conditions of flying personnel and genesis of single accidents. Different body lesions, sustained by victims of flight accidents, are deeply examined. They are divided into lesions pertaining to skeleton, internal organs and external teguments; and pathogenetic interpretation of each injuries is discussed. As conclusion, reconstruction of causes and ways of flight accident production is discussed. This can be possibly carried out through the examination of differential characteristics of various traumatic findings of the different types of accidents, considering kinedynamics of the single accident as well as the phase in which the injuries were sustained (precipitation, or explosive decompression with subsequent precipitation, or impact on the ground followed by an explosion or not, or explosion in flight followed by impact, or finally the terminal fire on board with or without inhalation of smoke or toxic gases). From this reconstruction useful elements can be obtained, for the prevention of flight accidents and dependent injuries. Author

N77-17716# Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome (Italy).

**LEGAL ASPECTS OF FLYING ACCIDENTS INVESTIGATION DISASTER VICTIMS IDENTIFICATION**

G. Paolucci *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 4 p refs

Avail: NTIS HC A07/MF A01

Biological and non-biological systems for identification of victims in aviation disasters are discussed and described in detail. Some of the methods mentioned are the following: non-biological method; (1) direct identification, (2) identification by exclusion, (3) identification by examination of clothing and personal effects; biological methods; (1) definition of race, (2) determination of sex (3) estimation of age (4) determination of individual characteristics. B.B.

N77-17717# Armed Forces Inst. of Pathology, Washington, D.C.

**PROCEDURES FOR IDENTIFICATION OF MASS DISASTER VICTIMS**

Robert R. McMeekin *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 8 p refs

Avail: NTIS HC A07/MF A01

The problems of identification of mass disaster victims is discussed. Various techniques and identification methods are cited. B.B.

N77-17718# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

**HISTOLOGY IN AIRCRAFT ACCIDENT RECONSTRUCTION**

G. Apel *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 3 p refs

Avail: NTIS HC A07/MF A01

Histological methods of examining organs of fatally crashed pilots are discussed as a means of revealing diseases which may have limited the flying fitness of a pilot. Various cardiac complications, rare nervous diseases, and communicable diseases endemic only in certain parts of the globe are cited as some of the causes revealed through histological examination of pilot fatalities. B.B.

N77-17719# Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

**THE ASYMPTOMATIC SILENT MYOCARDIAL INFARCTION AND ITS SIGNIFICANCE AS POSSIBLE AIRCRAFT ACCIDENT CAUSE**

G. Beckmann and W. Eisenmenger *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 3 p refs

Avail: NTIS HC A05/MF A01

Myocardial infarction in pilots is discussed as one of the numerous possible causes of aircraft disasters. Two cases are cited in which pilots 33 and 43 years old complained about retrosternal pains of short duration (1 minute) respectively nausea as encountered in hypoxia incidents. Since there was no subsequent pain, there was no cause for and examination by a physican so that the pilots continued their flying duty. After an interval of 10 months respectively 1 month the ECG taken during the periodic flying fitness examination revealed the symptoms of a myocardial infarction suffered by the respective pilots.

Author

N77-17720# Armed Forces Inst. of Pathology, Washington, D.C.

**CORRELATION OF OCCURRENCE OF AIRCRAFT ACCIDENTS WITH BIORHYTHMIC CRITICALITY AND CYCLE PHASE**

John H. Wolcott, Robert R. McMeekin, Robert E. Burgin (Natl. Transportation Safety Board), and Robert E. Vanowitch (FAA, Washington, D. C.) *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 14 p refs

Avail: NTIS HC A07/MF A01

The occurrence of aircraft accidents on various biorhythmic phases of cycles was studied. Aircraft accident data were obtained from the National Transportation Safety Board for general civil aviation and from the U. S. Army Agency for Aviation Safety for military accidents. The accidents were divided into two groups, pilot and nonpilot involved cases, using the causal factors given by the respective accident boards. No correlation was found between the occurrence of aircraft accidents and either the critical period, the negative phase, or the peak days of the negative phase of the biorhythmic cycles. Data were evaluated by chi-square analysis when considering all three cycles or the physical and emotional cycles alone, and all were studied with a critical period of 24 or 48 hours' duration. Author

N77-17721# Armed Forces Inst. of Pathology, Washington, D.C.

**THE INTERPERTATION OF PRECENTAGE SATURATION OF CARBON MONOXIDE IN AIRCRAFT-ACCIDENT FATALITIES WITH THERMAL INJURY**

Joseph M. Ballo and Abel M. Dominguez *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 8 p refs

Avail: NTIS HC A07/MF A01

Victims of aircraft-accident fatalities suffering severe thermal trauma (as defined by second- or third-degree burns and/or percent saturation of carboxyhemoglobin values of 10 or greater) were evaluated. Of 518 cases accessioned from 1968 through 1974, 83 had either sublethal or no physical trauma. The mechanism of death in such cases is (1) glottal spasm, bronchospasm, or acute edema of the upper respiratory passage, (2) cardiovascular collapse secondary to vagal inhibition, (3) acute thermal hyperkalemia potentiated by high levels of circulating cateholamines, (4) complete combustion of flammable material by on-board oxygen supplies, producing an intense fire without the production of CO, or (5) poisoning by other toxic products of combustion. Author

**N77-17722#** Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

**TOXICOLOGICAL ASPECTS IN THE INVESTIGATION OF FLIGHT ACCIDENTS**

G. Powitz *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 4 p refs

Avail: NTIS HC A07/MF A01

The working methods of the German flight toxicology working group were examined. Positive alcohol results required a determination of the water content and a test of possible putrefactive processes. The various procedures for blood alcohol determination were compared and it was found that the enzyme method furnished high values differing from others. Gas-chromatography identified some endogenous substances and putrefactive components respectively, some cases of joint occurrence are mentioned. The disadvantage of the photometric determination of carbon monoxide in burned corpses was illustrated. Extraction methods required for chromatographic separations of biological material were discussed and some disadvantages compared. Author

**N77-17723#** Royal Air Force Inst. of Pathology and Tropical Medicine, Aylesbury (England).

**RECENT AGRICULTURAL AIRCRAFT ACCIDENTS IN THE UNITED KINGDOM**

D. G. Wooten *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 7 p

Avail: NTIS HC A07/MF A01

Agricultural aviation accidents were analyzed for cause, geographical distribution, and frequency. The probability of an accident occurring increased indirectly with age of the pilot and directly with his experience. Pilot error was the direct cause of the majority of accidents. Improved education and legislation would help to reduce the exposure to toxic chemicals. Author

**N77-17724#** Armed Forces Inst. of Pathology, Washington, D.C. Div. of Aerospace Pathology.

**ACCIDENT RECONSTRUCTION FROM ANALYSIS OF INJURIES**

Joseph M. Ballo and Robert R. McMeekin *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 11 p refs

Avail: NTIS HC A07/MF A01

From an ongoing study of over 500 fatally injured crewmembers of U.S. military aircraft every year and an analytically oriented research program in which injury patterns were verified by computerized simulation techniques, estimates were prepared of injury correlated with both the magnitude and the direction of the applied decelerative forces. When an accurate tabulation of postmortem injuries was correlated with measurements of the path of the aircraft after it struck the ground, the dynamics of impact were deduced. This process was invaluable for accidents that occurred without witnesses or survivors and in which crash damage to flight instruments or the absence of flight-data recorders made calculation of impact kinematics difficult. Skeletal injuries, particularly vertebral compression fractures, lacerations and contusions of viscera, aortic tears and lacerations, and cutaneous contusions caused by compression of harnesses and seat belts were important factors in determining the direction and magnitude of the deceleration vector. Author

**N77-17725#** Army Aeromedical Research Lab., Fort Rucker, Ala. Bioengineering and Life Support Equipment Div.

**HEAD INJURY PATHOLOGY AND ITS CLINICAL, SAFETY AND ADMINISTRATIVE SIGNIFICANCE**

Stanley C. Knapp and Thomas M. Erhardt *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 9 p refs

Avail: NTIS HC A07/MF A01

A review of head trauma in war, vehicular accidents, sports and aviation demonstrated that while the head constitutes roughly 9 percent of the body's weight, surface area and volume, it is implicated in 7 out of 10 body injuries. Head trauma causes an unacceptable 1 in 4 deaths and for motorcycling it causes a staggering 1 out of every 2 deaths. It was proposed that examination of head trauma, its costs and the effectiveness of provided protection must apply the analytic tools of epidemiology not only to the injury but to the equipment as well. Prevention requires anticipatory action, based on the knowledge of protective performance history, in order to make the onset or further occurrence of injury unlikely. Author

**N77-17726#** Naval Aerospace Medical Research Lab., New Orleans, La.

**NEUROPATHOLOGY AND CAUSE OF DEATH IN U.S. NAVAL AIRCRAFT ACCIDENTS**

Channing L. Ewing and Friedrich Unterharnscheidt *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 6 p refs

Avail: NTIS HC A07/MF A01

A frequent cause of death in naval aviation was hypothesized as drowning, associated with acceleration concussion perhaps due to neck stretch. Aircraft accident fatality data for the U.S. Navy were presented as a measure of the population at risk and recent data from the literature which might explain the causative mechanism of acceleration concussion are presented. Recommendations for improved standard autopsy protocols for aircraft fatalities were presented. Author

**N77-17727#** Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).

**CLARIFICATION OF A FATAL HELICOPTER GROUND ACCIDENT THROUGH FORENSIC MEDICAL METHODS**

G. Apel *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 3 p refs

Avail: NTIS HC A07/MF A01

Based on the investigation of a fatal helicopter ground accident, which was clarified through forensic medical methods, problems of accident prevention were pointed out, especially the conspicuity of rotating propellers, tail rotors and safety markings. The dangers encountered as a result of vigilance and concentration disturbances in personnel caused by stress of noise, workload, and distraction were discussed. Safety measures required were also presented. Author

**N77-17728#** Royal Air Force Inst. of Pathology and Tropical Medicine, Aylesbury (England). Dept. of Aviation Pathology and Forensic Medicine.

**FATAL HELICOPTER ACCIDENTS IN THE UNITED KINGDOM**

A. J. C. Balfour *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 8 p

Avail: NTIS HC A07/MF A01

There were 27 fatal helicopter crashes investigated in the United Kingdom in the years 1956 to 1975; there were 52 deaths and 15 survivors. Of the crashes 25 percent were survivable and produced 15 percent of the casualties and 73 percent of the survivors. There were 44 men killed in the non-survivable accidents and 4 escaped. In the 6 survivable crashes 8 men died; 5 drowned, one died from fire, one died from traumatic



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asphyxia, and one submarined out of his safety harness. The casualties emphasized the need for further improvements in training and in helicopter crash worthiness, and for the best early rescue facilities that can be provided. Author

N77-17729# Brooke Army Medical Center, Fort Sam Houston, Tex.
**ROENTGENOGRAPHIC EVALUATION IN FATAL AIRCRAFT ACCIDENTS**
Richard A. Mosby and Robert R. McMeekin *In* AGARD Recent Experience/Advan. in Aviation Pathol. Dec. 1976 7 p refs
Avail: NTIS HC A07/MF A01

The roentgenogram was evaluated as having great value in the investigation of fatal aircraft accidents. The entire spectrum of the accident was evaluated with this modality magnifying and enhancing the information available. Calibration of the roentgenogram for use in the investigation of a fatal aircraft accident provided even more useful and factual data. Author

N77-17730# Civil Aeromedical Inst., Oklahoma City, Okla.
**AN INVESTIGATION OF TIME-SHARING ABILITY AS A FACTOR IN COMPLEX PERFORMANCE**
Alan E. Jennings and W. Dean Chiles May 1976 16 p refs
(AD-A031881/6; FAA-AM-76-1) Avail: NTIS HC A02/MF A01 CSCL 05/5

Thirty-nine men were tested on a total of six tasks; performance was measured on each task presented individually and on two complex tasks made up of three-task subsets. The tasks measured monitoring, arithmetic, pattern-discrimination, tracking, and problem-solving performance. Factor analyses were performed on the resultant data to determine if there would emerge a time-sharing ability, defined as a reliable source of variance associated with complex performance but independent of simple-task performance of the constituent tasks. High loadings were found for two different monitoring tasks for complex performance but negligible loadings for these tasks for simple performance. Separate independent factors were found for the two monitoring tasks when they were performed under simple-task conditions. The monitoring measures appear to possess properties that would be expected of measures of a time-sharing ability. The findings suggest that a suitable measure of time-sharing ability would be of value in the selection and screening of candidates for complex jobs. Author

N77-17731# National Swedish Road and Traffic Research Inst., Linkoeping.
**EFFECTS OF SMALL DOSES OF ALCOHOL ON DRIVER PERFORMANCE IN EMERGENCY TRAFFIC SITUATIONS**
Hans Laurell 1975 27 p refs Sponsored by Natl. Swed. Road Safety Office
(VTI-68-A) Avail: NTIS HC A03/MF A01

The effects on driver performance of Blood Alcohol Concentrations (BAC) below 50 mg % were studied in two contexts: 1. in a critical automobile driving situation involving emergency braking and evasive maneuvers and 2. in a surprise situation that followed the first one and featured the sudden appearance of a man-shaped obstacle blocking the roadway. The results indicate the detrimental effects of alcohol at a total BAC average of 42 mg %. In the braking and maneuvering task, drivers under the influence of alcohol hit significantly more pylons and took significantly longer distances to stop. There was also a strong tendency for alcohol to impair performance in the surprise situation. Under the influence of alcohol five drivers out of ten collided with the obstacle; this was the case for only one driver out of ten in the control (non-alcohol) condition. Author (ESA)

N77-17732# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
**DEVELOPMENT OF A STANDARDIZED MEASUREMENT AND EDP EVALUATION PROGRAM FOR ERGONOMIC DATA AND FLIGHT DATA. PART 1: TECHNICAL PRINCIPLES. PART 2: EVALUATION COMPUTER PROGRAM [ENTWICKLUNG EINES STANDARDISIERTEN MESS- UND EDV-AUSWERTUNGSPROGRAMMES FUER ERGONOMISCHE DATEN UND FLUGDATEN. TEIL 1: TECHNISCHE GRUNDLAGEN ZUR ERMITTLUNG UND AUFZEICHNUNG ERGONOMISCHER MESSDATEN. TEIL 2: BESCHREIBUNG DER AUSWERTUNGS-RECHENPROGRAMME]**
U. Miller and H. Fickenwirth 26 May 1976 197 p refs In GERMAN
(Contract BMFT-T/RF-36/RF-360/31107)
(MBB-UFE-1231) Avail: NTIS HC A09/MF A01

The sensors and recorders are described which are necessary for the measurement of biomedical data in order to determine physiological stress in pilots. A portable cassette tape recorder was developed especially for flights without telemetry, e.g., MRCA terrain following missions. The development of an evaluation program for standardization of computer processing of biomedical data and flight parameters is reported. ESA

N77-17733# Naval Postgraduate School, Monterey, Calif.
**THE SIGNIFICANT PARAMETERS AFFECTING THE MODELLING OF TARGET ACQUISITION OF GROUND COMBAT TARGETS FROM TACTICAL HELICOPTERS M.S. Thesis**
Basil Grahame Baskerville Jun. 1976 68 p refs
(AD-A028853) Avail: NTIS HC A04/MF A01 CSCL 15/7

The acquisition of ground targets in combat from tactical helicopters, employing low-level flying techniques, is a complex process. The author examines the air-to-ground target acquisition process and investigates the parameters affecting this process. The tactical environment of helicopters is outlined and those parameters deemed significant and/or peculiar to this environment are identified. Current mathematical models of air-to-ground target acquisition are reviewed. Those which are considered relevant to this particular problem are described. The author concludes that there are no validated models for predicting target acquisition from tactical helicopters. Author (GRA)

N77-17734# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
**INTERNATIONAL ANTHROPOMETRIC VARIABILITY AND ITS EFFECTS ON AIRCRAFT COCKPIT DESIGN**
Kenneth W. Kennedy Jul. 1976 22 p refs
(AF Proj. 7184)
(AD-A027801; AMRL-TR-72-45) Avail: NTIS HC A02/MF A01 CSCL 01/3

This paper is concerned with high performance, single seat, military aircraft cockpits and the problems encountered in accommodating them to the anthropometric requirements of foreign military users. These problems often are very difficult. Design changes invariably required to cope with any significant anthropometric differences are fraught with seemingly insurmountable economic and engineering problems. Still, malaccommodation in aircraft not only produces a condition in which the product is inconvenient to operate, but one in which the user's safety and the basic mission of the aircraft can be compromised. GRA

N77-17735# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
**SUMMARY REPORT OF AMRL REMOTELY PILOTED VEHICLE (RPV) SYSTEM SIMULATION STUDY 4 RESULTS**
Niles M. Aume, Robert G. Mills, and Aldo A. Gillio Jun. 1976 43 p
(AD-A028877; AMRL-TR-76-55) Avail: NTIS HC A03/MF A01 CSCL 01/3

The AMRL RPV System Simulation and Research Program was initiated in response to requirements for support of the design of the man-machine/environment interface of AF RPV systems. The major objectives of the AMRL RPV System Simulation and Research Program are as follows: (1) Perform RPV system design evaluation studies, i.e., evaluate alternative design configurations, assumptions, operating procedures, etc.; (2) assess RPV system effectiveness, i.e. evaluate the expected effectiveness of a given system configuration such as its overall probability of achieving a target, etc.; (3) provide man-machine/environment interface engineering data, i.e. recommend displays etc.; (4) test bed new technology, e.g. evaluate effectiveness of

contractor designed consoles, video bandwidth compression techniques, etc. The results of the fourth simulation study are reported herein. This study included automatic RPV heading correction and position report smoothing functions in the simulation. The study employed scenarios requiring a limited number of support mission RPVs, via reprogramming, to provide coverage for a set of Strike RPVs (or manned vehicles). The study evaluates RPV system performance under the simultaneous effects of RPV Automatic Heading Correction Cross Track Threshold, Total Number of RPVs Under System Control, Ratio of Strike Set to Support Vehicle Set, and Display (Window) Sizes or Scales. GRA

**N77-17736#** School of Aerospace Medicine, Brooks AFB, Tex.
**HUMAN COMPATIBILITY TESTING OF A PRESSURE-BREATHING, MASK, MBU-12/P Final Report, Apr. - Dec. 1975**
Julian P. Cooke May 1976 16 p refs
(AF Proj. 7164)
(AD-A027823; SAM-TR-76-11) Avail: NTIS HC A02/MF A01 CSCL 06/11

Subject preference for the MBU-12/P mask over the MBU-5/P was revealed by results from more than 48 altitude-chamber tests with each of these oxygen pressure-breathing masks. According to subject evaluation, the assets of the MBU-12/P mask include: more comfort; better ability to Valsalva; more freedom of movement of the head; less redness and marking of the face; greater peripheral vision; and, at altitude, a tighter seal against loss of oxygen. The responses of both masks at low and high temperatures were similar. Subjective evaluation of communication revealed no apparent difference between the two types of mask. Moderate improvement was measured in tendency of the MBU-12/P mask to hold to the face and not leak during exposure to increased gravity fields of 3, 5, and 7 Gz. Author (GRA)

**N77-17737#** School of Aerospace Medicine, Brooks AFB, Tex.
**LASER-PROTECTION EYEWEAR: AN EVALUATION PROCEDURE Interim Report, Feb. 1974 - Dec. 1975**
William J. Fodor May 1976 16 p refs
(AF Proj. 6301)
(AD-A027826; SAM-TR-76-19) Avail: NTIS HC A02/MF A01 CSCL 06/18

A program for evaluating laser-protection eyewear has been developed. This program includes a battery of optical tests before and after 'weathering' the test item under standard conditions. Unique aspects of the evaluation are a high-energy bleaching test and high-optical-density tests. Guidelines for interpreting the test results are discussed. Author (GRA)

**N77-17738#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
**EFFECTS OF HIGH G ON PILOT MUSCLE STRENGTH AVAILABLE FOR AIRCRAFT CONTROL OPERATION**
K. H. E. Kroemer Jul. 1976 4 p refs Repr. from Preprints of 1973 Annual Scientific Meeting, Aerospace Medical Association, Las Vegas, Nevada, 7-10 May 1973 p 255-256
(AF Proj. 7184)
(AD-A027802; AMRL-TR-73-22) Avail: NTIS HC A02/MF A01 CSCL 06/19

High accelerations, especially in the Z-direction, prevail during certain flight phases of airplanes or spacecraft. The resulting 'G-forces' can severely hamper the crew's ability to move body segments and/or to operate controls as indicated in abundancy by (often anecdotal) case reports. Grether's overview of the literature, reveals surprisingly little systematic research regarding the capability to exert muscular strength for control operation under high acceleration. This lack of information does not only pertain to the operation of seldomly used or new controls (like for ejection initiation during extreme G-conditions), but applies even to such common controls as stick, throttle, or sidearm controller. GRA

**N77-17739#** Manned Systems Sciences, Inc., Northridge, Calif.
**HUMAN FACTORS RESEARCH AND THE DEVELOPMENT OF A MANNED SYSTEMS APPLICATIONS SCIENCE: THE SYSTEMS SAMPLING PROBLEM AND A SOLUTION**
Dorothy L. Finley and Frederick A. Muckler Jul. 1976 50 p refs
(Contract N00014-74-C-0324; NR Proj. 274-244; NR Proj. 364-090)
(AD-A029417) Avail: NTIS HC A03/MF A01 CSCL 05/5

Human factors specialists, or 'systems psychologists', have extensively used the systems approach to define and solve man-man and man-machine problems. As of yet, however, there has been no attempt to develop a body of knowledge on the dimensionalization of manned systems. That is, a body of knowledge regarding what dimensions define a system, as opposed to such components as an individual operator or piece of equipment. For example, what classes of system dimensions are there and what role do they play in addressing what problems. For the operator component, for example, there are skill dimensions vs. ability dimensions; whether one works with one or the other or both classes depends on what the question is. It is suggested that a body of knowledge on manned systems dimensions would be useful as the stepping stone which facilitates the solution of new problems and as a basis for organizing human performance data in a way applicable to systems design problems. This report points out: (1) The need to begin identifying and incorporating systems design and operation parameters into research programs (in addition to, for example, visual display and operator performance dimensions); (2) The nature of the systems research and dimensionalization problem, and (3) A model to support the systems dimensionalization process. This process is defined as essentially one of taxonomization for the purpose of developing the measure set. Author (GRA)

**N77-17740#** Sierra Engineering Co., Sierra Madre, Calif.
**ANTHROPOMETRIC TEST DUMMY, MODEL 825-50 OPERATION AND SERVICE MANUAL Final Report, 1 Dec. 1972 - 28 Feb. 1975**
J. L. Roshala and Leonard E. Popp Aug. 1976 100 p
(Contract DOT-HS-254-3-568)
(PB-258384/7; DOT-HS-801-972-2; TR-825-900-2) Avail: NTIS HC A05/MF A01 CSCL 13F

A test dummy was developed which NHTSA used for compliance tests with appropriate Federal motor vehicle safety standards in the evaluation of protection systems for vehicle occupants during real and simulated impact conditions. A corresponding test dummy data package was generated which is made available to any source interested in manufacturing, checking, comparing with other dummy configurations and otherwise verifying the accuracy and precision of the various details. GRA

**N77-17741#** North Carolina Univ., Chapel Hill. Highway Safety Research Center.
**A STATISTICAL ANALYSIS OF SEAT BELT EFFECTIVENESS IN 1973-1975 MODEL CARS INVOLVED IN TOWAWAY CRASHES. VOLUME 1 Final Report, 1 Jul. 1975 - 31 May 1976**
Donald W. Reinfurt, Claudio Z. Silva, and Andrew F. Seila Sep. 1976 165 p refs
(Contract DOT-HS-5-01255)
(PB-258542/0; DOT-HS-802-035-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 13F

The data were collected in five different geographic regions. Weighted sample size available for the analysis was 15,818 occupants for which there is complete information on belt usage, injury level, age, crash configuration, vehicle weight, and damage severity. A sensitivity analysis was carried out to determine the effect on the estimates of including various subsets of the control variables. The estimates were reworked using direct injury costs derived largely from insurance data. GRA

**N77-17742#** Naval Air Development Center, Warminster, Pa. Crew Systems Dept.
**AN APPARATUS FOR EVALUATING PILOT PREFERENCE OF ELECTRONIC DISPLAY INFORMATION AND FORMATS**

William A. Breitmaier 28 Jul. 1976 19 p refs
(AD-A028723; NADC-76195-40) Avail: NTIS
HC A02/MF A01 CSCL 05/8

An apparatus was developed for use in evaluation of electronic displays. The apparatus consists of four random access slide projectors, remote controls for the projectors, and a static cockpit mock-up with nonfunctional controls. The apparatus was used in a preference survey of the Engine Management Display portion of the Advanced Integrated Display System (AIDS). The apparatus provides a simple, inexpensive, flexible, and timely means for evaluating potential users' preference of display information and formats. GRA

N77-17743# Payne, Inc., Annapolis, Md.
**THE HEAT PULSE ASSOCIATED WITH ESCAPE FROM AN AIRCRAFT AT SUPERSONIC SPEED Final Report, 18 Nov. 1975 - 31 Mar. 1976**
Peter R. Payne Wright-Patterson AFB, Ohio AMRL Jun. 1976 55 p refs
(Contract F33615-75-C-5096; AF Proj. 7231)
(AD-A028988; WP-148-6; AMRL-TR-76-2) Avail: NTIS
HC A04/MF A01 CSCL 01/2

The air temperature environment in supersonic escape is defined conservatively, and the heat pulse associated with deceleration after escape is calculated. This is compared with data on the human body's tolerance to short period heat pulses, using data in the literature and data derived from new experiments to show that thermal injury is not a problem when the escapee is wearing a full pressure suit. Exposed skin may experience pain above a Mach number of four (M = 4), however, and blister above M = 5. Author

N77-17744# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
**SPEECH COMMUNICATION CAPABILITY AND HEARING PROTECTION OF USAF INFLIGHT HEADGEAR DEVICES**
Henry C. Sommer Jun. 1976 16 p refs
(AF Proj. 7231)
(AD-A029007; AMRL-TR-75-67) Avail: NTIS
HC A02/MF A01 CSCL 01/2

In this investigation, both speech intelligibility and hearing protection were determined for various USAF inflight communication headgear devices. Speech intelligibility was measured with talker to listener relationships of quiet to quiet, quiet to noise, noise to quiet and noise to noise. The noise used for both talking and listening was set to 110 dB in each octave band from 63 Hz to 2 kHz and 105 dB in the 4 kHz and 8 kHz octave bands. Speech materials were recorded using both boom (kiss-to-talk) and oxygen mask microphones. The results reveal that many noise exposure conditions now specified as satisfactory for military aircraft may be in the range where adequate speech communication cannot be maintained. GRA

N77-17745# Air Force Human Resources Lab., Brooks AFB, Tex.
**SITUATIONAL EMERGENCY TRAINING: F-15 EMERGENCY PROCEDURES TRAINING PROGRAM. PHASE 1 Interim Report, Jul. 1975 - Jan. 1976**
Jack A. Thorpe, Elizabeth L. Martin, Bernell J. Edwards, and Edward E. Eddowes Jun. 1976 23 p
(AF Proj. 1123)
(AD-A028483; AFHRL-TR-76-47(1)) Avail: NTIS
HC A02/MF A01 CSCL 01/2

This report evaluates the current emergency procedures training program used for the F-15 and compares it to Boldface emergency procedures training programs. The report documents the current F-15 program--a non-Boldface program. Traditional emergency procedures, common to other USAF weapons systems featuring Boldface procedures which must be committed to memory, do not exist for the F-15. Only three rules, applicable in all emergency/abnormal situations, are specified for F-15 operations: maintain aircraft control, analyze the situation and take the proper action, and land as soon as practicable. This report evaluates an optimum emergency procedures training program for the F-15 and provides the basis for comparing the F-15 training program with Boldface training programs. The strengths and weaknesses of both approaches are noted, and five conclusions are derived from this comparative analysis. GRA

N77-17746# Naval Air Engineering Center, Lakehurst, N.J. Engineering Dept. (SI)
**PRIMARY FLIGHT CONTROL WORK STATION IMPROVEMENT STUDY, PHASE A Final Report, Jul. 1975 - Jun. 1976**
Tak Po Sit and Neal G. Senholzi 23 Aug. 1976 45 p refs
(AD-A029650; NAEC-ENG-7916) Avail: NTIS
HC A03/MF A01 CSCL 17/2

This study shows that practical changes may be made by which the efficiency and effectiveness of the Pri-Fly Control Work Station can be improved. These recommended changes are grouped according to their impact in the areas of environment, communication, equipment arrangement and visibility.
Author (GRA)

N77-17747*# Kanner (Leo) Associates, Redwood City, Calif.
**POSSIBLE UNIQUENESS OF RATIONAL LIFE IN THE UNIVERSE**
I. S. Shklovskiy Washington NASA Feb. 1977 27 p refs
Transl. into ENGLISH from Vopr. Filosofii (USSR), no. 9, 1976 p 80-93
(Contract NASw-2790)
(NASA-TT-F-17404) Avail: NTIS HC A03/MF A01 CSCL 06F

Arguments for and against the uniqueness, or virtual fault detection of either a combinational or a synchronous sequential network, and to simplify the test generation procedure. Models for PLM (programmable logic module) and CMM (controlled memory module) were depicted to enhance the testability of a given network. The network topology which will enhance its testability was first explored. Systematic design algorithms to implement either a combinational or a synchronous sequential network which will satisfy the specified topology were then developed, and the corresponding fault detection procedure was investigated. A real time, on-line, self-testing digital system was proposed, and the performance on the system was examined. Dissert. Abstr.

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